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FOOD TECHNOLOGY

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FOOD TECHNOLOGY

VOLUME 2 OCTOBER, 1948 NUMBER 4

Editorial

Industrial and Legal Viewpoints

A by-product of the Emblem Committee's survey has been evidence of divergence in opinions as to what constitutes "Food Technology." This is not surprising if one considers the numbers of angles from which our profession may be approached.

In classifying the activities of food technologists, one immediately thinks of Production, Control, Research, Development, and Teaching. Responsibilities delegated to food technologists may include supervising supplies and raw materials, maintaining and improving quality of products, minimizing wastes and production costs, developing new products, profitably recovering by-products, disposing of wastes, determining nutritional properties, and maintaining favorable consumer acceptance.

Each food technologist must ordinarily consider the impact of his activities upon suppliers, employers, employees, neighbors and customers. Boards of health and state and federal inspection agencies police food processing operations not only in relation to standards of identity and quality; but also in the effort to prevent hazards, frauds, nuisances and unfair competition.

In addition to keeping abreast (or ahead) of current scientific developments relating to their field, food technologists can rarely ignore the economic and legal implications of their work. It is for this reason that a section on "INDUSTRIAL AND LEGAL VIEWPOINTS" is included in your journal.

Outstanding discussions have demonstrated the value of this section and have resulted in a decision to invite additional contributions sharing observations and experiences of general interest. While restrictions in space will impose limits upon the number of articles which can be published, the editors will welcome opportunities to consider concise discussions for this section.

Subjects of general interest include reports of recent court decisions relating to food processing, employees, raw materials, water supply, waste disposal, contractual relationships and to storage and pricing policies and problems as well as to consumer complaints.

Of great interest to food technologists are such subjects as management of research, food technology as insurance against obsolescence, food technology in relation to financing and to general management, and the merits and demerits of current trends in developing standards. Problems vary appreciably with the size and complexity of corporations. Excellent systems used in large corporations have been ably described in past issues of FOOD TECHNOLOGY. Neat departmentalization may be impractical in a smaller organization where one laboratory may double in brass, serving for control, research, development and sales service.

In smaller organizations the question is not infrequently asked: Should the laboratory be over the production department or under it? The writer believes that these departments should be of equal responsibility with a relationship comparable to that of a physician and patient, where the patient might be a champion athlete. It is the

athlete's job to win victories, but it is the doctor's responsibility to keep him in condition, to see that when the athlete gets something wrong with him, it is quickly remedied and recurrence avoided. When the doctor sees something wrong he may warn the patient and prescribe a remedy. If his advice is followed, the doctor is responsible for the results. If the advice is disregarded, the patient must answer for the consequences.

Such a relationship has certain practical advantages in smaller operations, and discussions of experiences and opinions in this and related fields will find an interested audience among the readers of FOOD TECHNOLOGY.

J. L. HEID.

Salute to Canadian Food Technologists

The subject of organization is prominent in the thoughts and discussions of food technologists in Canada. Group meetings have been held in several of the largest cities, including Montreal, Toronto, Ottawa, and Vancouver and, in the far east and far west (Montreal and Vancouver), matters have advanced beyond the discussion stage. Organizations of a permanent nature have been formed through the election of officers. Dr. R. A. Chapman of the Department of Chemistry, Macdonald College, is Chairman of the Montreal group. We are not informed on who is Chairman in Vancouver but the report does state that the members of the group have had an assessment of an organization fee so it is apparent that the move is a serious one.

FOOD TECHNOLOGY extends congratulations to the Canadians on their progress. There are members of the Institute of Food Technologists among those who are active in the steps that are being taken to organize the groups in Canada. The Institute would feel honored if the groups would give serious consideration to affiliation with the Institute as regional sections.

C. O. BALL.

Fundamental Training Is Important

In the news section of this issue is reproduced an interesting report by the Committee on Education and Curriculum of the Institute of Food Technologists. The report gives the results of a comprehensive survey which was conductd by the committee in following out its purpose to keep abreast of the most advanced thinking pertaining to educational curricula in food technology.

A well conceived questionnaire, which was the medium through which the information for the report was collected, was submitted to the proper persons from whom to obtain opinions on curriculum building which are the result of experience in educational work in fields closely related to food technology—members of the I. F. T. who hold staff positions in universities and colleges.

The questionnaire was comprehensive in its scope but it contained one unintentional omission which was quickly detected by those who were polled. Mathematics was omitted from the compendium of course data, on which the educators were asked to vote. Nevertheless, 56% of the respondents inserted mathematics as a requirement and 48% expressed the opinion that mathematics required of food technologists should include two courses in calculus.

Seventy-three other subjects were listed which the committee felt might reasonably be included in food tech-

nology curricula. Of these, only twenty-two received an endorsement either as strong as or stronger than that given to mathematics, the "write-in" subject. It is conceivable that, if mathematics had appeared on the questionnaire, its endorsement would have been even stronger.

This incident about mathematics is related here because it constitutes an important part of the over-all significance of the response to the questionnaire. The concurrence of opinion expressed in the response is that the greatest value of a food technology curriculum lies in its fundamental subjects and not in its more practical specialisms. The implication is, of course, that the person who is well trained along fundamental lines can readily apply the principles he has learned to specialized fields of practical activity. If he is not apt in doing this, he probably will not be apt to show progressive tendencies if he is trained predominantly in the practical aspects of the field.

Another article in this issue, appearing in the section, "Industrial and Legal Viewpoints," is a record of a seminar on Technical Fisheries Education, in which the subject of educating technologists for fisheries work was discussed with the problems of industry in mind. In the article are expressed pro and con viewpoints on the idea that specialized training should be favored over generalized training. One speaker regrets the fact that some food technologists with college degrees require from one to two years for training in the fundamentals of fishery canning; another states that often it is most productive of good results to bring into fisheries work a man with no special knowledge of that field.

The basic difference between these two viewpoints seems to lie in the time range to which they apply. A man who has specialized in practical subjects is unquestionably more valuable during the first year or two after graduation than a man of equal innate capacity whose college training has been of a more fundamental nature. The real pay-off comes, however, five years or ten years later when originality and resourcefulness have had an opportunity to show themselves.

A repetition of words by Tyron Edwards and James Beattie, describing the long-range concept of education, seems fitting here. Edwards: "The great end of education is to discipline rather than to furnish the mind, to train it to the use of its own powers rather than to fill it with the accumulations of others." Beattie: "The aim of education should be to teach us rather how to think than what to think—rather to improve our minds, so as to enable us to think for ourselves, than to load the memory with the thoughts of other men."

C. O. Ball.

CONTINUOUS SANITIZING OF EQUIPMENT IN THE DRIED FRUIT INDUSTRY [a]

REESE H. VAUGHN,[b] FRANK H. WINTER,[c] AND EDWARD E. SMITH [d]

This paper presents practical suggestions relating to effects of continuous sanitizing on control of micro-organisms on dried fruit processing equipment.

INTRODUCTION

Microbiological quality, one of the important manifestations of acceptable plant sanitation, is becoming an increasingly important factor in determining the final quality of foods. Microbiological quality standards for milk and milk products are well established. Transactions in certain frozen and dehydrated foods frequently depend upon certification of microbiological quality of the foods. Tentative standard methods for the microbiological examination of certain frozen, dehydrated, brined, salted and pickled foods have been proposed *(1, 2, 3)*. It is inevitable that microbiological quality standards will be developed for all such foods preserved by physical and chemical means other than heat treatment in sealed containers (canning). However, before equitable standards of microbiological quality can be made, even on a tentative basis, more information must be accumulated concerning those aspects of sanitation which influence microbial populations apt to survive processing and remain on or in the finished food.

It is a first premise that no operation in food processing should allow the addition of excessive numbers of micro-organisms to the product at any stage of preparation. However, most routine steps in preparation add to rather than detract from the microbial populations of the food. The effects of some of these operations have been described elsewhere *(4, 5, 6, 7, 8)*. For several years the trend in the dried fruit industry has been toward the packing of fruits, particularly figs, prunes and dates, of high moisture content as compared with former practice. Consumer acceptance is responsible for the trend because when the moisture content of good quality fruit is raised to about 30 per cent, the palatability, texture and appearance are markedly improved. Increase of the moisture content, however, introduces certain problems with respect to microbial deterioration. These problems require special treatments of the fruit at time of packing as well as special attention to sanitation (Mrak et al. *9, 10, 11*) particularly of plant equipment.

The following discussion is concerned with the control of micro-organisms on equipment which, if heavily contaminated, can cause serious recontamination of the fruit during preparation for packing.

EXPERIMENTAL

The general steps in the preparation of dried fruit for packing include washing to remove surface dust, processing and final inspection sorting and grading. Any of these steps may cause increases or reductions in the populations of micro-organisms found on the fruits at the start of preparation.[e]

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[a] Presented before the Southern California Section of the Institute of Food Technologists at Los Angeles, California, February 20, 1948.

[b] Division of Food Technology, University of California, Berkeley, Calif.

[c] Research Department, United Date Growers Association, Coachella, Calif.

[d] Engineering Department, Valley Date Gardens, Indio, Calif.

[e] The microbial populations found on the dried fruits at such time vary with the types of fruit, moisture content, method of drying (sun-drying *vs.* dehydration), addition of sulfur dioxide, method and length of storage, etc. For a detailed discussion, consult Mrak et. al., 9, 10, 11.

Washing may cause a marked increase in the microbial contamination of dried fruits because of too generous recirculation of the wash water. Processing, however, will reduce the recontamination to a minimum if heat is applied. Subsequent recontamination then is the result of contact of the fruit with contaminated surfaces of equipment or workers' hands. Post-processing equipment generally consists of conveyor belts or combinations of bucket elevators and conveyor belts to carry the fruit for final inspection and packing operations. The fruit may be packed directly from the belts or by use of filling machines if bulk-packed or collected in fruit boxes and hand-packed at special place-pack tables by women. In the hand-pack type of operation the workers wipe their fingers frequently with hand cloths in order to remove the sticky, sugary residue picked up from the surface of the fruits they handle.

In the operations described above two obvious sources of recontamination which are not easily controllable are the belt surfaces and the hand cloths. Continuous sanitizing has been advocated for several years for control of excessive microbial contamination of certain equipment used in the food industries *(6, 7, 12)*.

A. *Continuous control of micro-organisms on conveyor and inspection belts.*

Data which show the effect of sanitizing on conveyor and inspection belts used in the dried fruit industry are to be found in Table 1. Part of the data was obtained

TABLE 1

The Effect of Continuous Sanitizing on Microbial Populations of Dried Fruit Conveyor Belts

Belt	Treatment (1)	Time in Use When Sampled	Numbers of Microorganisms (2) per 4 square inches of Surface
1	Cleaned and sprayed with OCl soln. night before	At start of a.m. shift	90,000
1		3 hours later	2,500,000
2	(3) Continuous Cl-T soln.	At start of shift	300
		2 hours later	33,000
3	(3) Intermittent wiping with Cl-T treated cloths	½ hour	3,000
4	(3) Intermittent wiping with Cl-T treated cloths	2 hours	1,500
5	(3) Intermittent wiping with Cl-T treated cloths	4 hours	1,200
6	(3) Intermittent wiping with Cl-T treated cloths	7 hours	1,500

(1) Chlorinated water contained between 100 and 200 p.p.m. available chlorine when fresh.

(2) Samples taken according to method described by Vaughn and Stadtman, 1945. Counts made on Tryptone glucose agar with bromcresol purple (NCA formula).

(3) Treated water changed at 2 hour intervals.

with a belt continuously treated by immersion as shown in Figure 1. The remainder of the belts were wiped by hand intermittently with cloths rinsed in water treated with a sanitizing chemical. The use of a sanitizing solution markedly reduced the microbial contamination of the belts regardless of the method of application.

The economic disadvantages of the intermittent method of wiping the belts are obvious. If the belts are being operated to the best advantage they are carrying an economic load of fruit and the workers have no time for wiping the belts by hand.

Two advantages of the continuous immersion method for cleaning belts are not shown in the table:

1) The belts can be kept clean and free from excessive loads of food debris and micro-organisms throughout the period of operation.
2) The belts being clean at all times, need no involved clean-up at the end of the operating period.

In practice it is recommended that the treated water for use in the immersion tank be changed at intervals of not more than 2 hours. Experiments must also be conducted to determine the extent to which the immersion water need be treated to

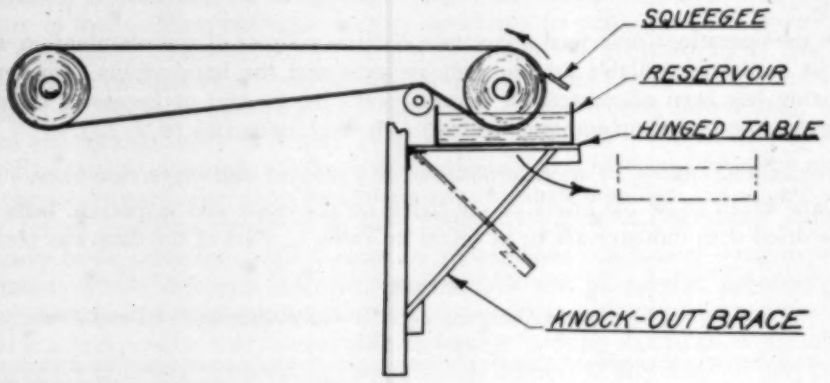

FIG. 1. An immersion type of continuous belt sanitizer.

fulfill cleaning and sanitizing requirements for its specific use. The application of sufficient tension on the squeegee bar is necessary to insure that the belt will be wiped dry at all times. It is also an important operational requisite that the squeegee be easily demountable so that it may be cleaned as needed.

If these precautions are taken belt cleansing by the immersion method will be successful.

B. *Continuous control of micro-organisms on place-packers' hand cloths.*

As already indicated, frequent use is made of hand cloths to remove the sticky, sugary residue from the hands of the place-packers of various dried fruits to prevent loss of dexterity in the place-packing operations. Naturally it is desirable to keep such hand cloths clean and free from excessive microbial contamination. Continuous sanitizing will control the micro-organisms as is seen from the data accumulated in Table 2. A marked reduction in the total number of micro-organisms found per square inch of cloth was effected by use of treated rinse water. The tests showed no particular difference in effectiveness of hypo-chlorite or chloramine-T. Other sanitizing agents were not tested. It is of particular significance that the continuous treatment of the rinse water resulted in significant reduction in numbers of coliform bacteria. It must be recognized that the treated rinse water for the cloths must be changed at intervals not to exceed 2 hours if the method is to be effective.

DISCUSSION

The installation and operation of the immersion type of belt washer has several advantages over the revolving brush type of washer (shown in Figure 2) which must be considered.

TABLE 2

The Effect of Continuous Sanitizing on Microbial Populations of Dried Fruit Hand Packers' Cloths

Hand Cloth	Rinse Water Treatment (2)	Time in Use When Sampled	Microbial populations per square inch (1)	
			(3) Coliform Bacteria	(4) Total numbers
1	None	More than 1 day	400,000	400,000,000
2	None	More than 1 day	40,000,000	278,000,000
3	None	At least 1 day	30,000	32,000,000
4	None	At least 1 day	10,000	4,800,000
5	Cl-T	1 hour	less than 100	174
6	Cl-T	4 hours	less than 100	20,000
7	OCl	2 hours	less than 100	less than 100
8	OCl	4 hours	less than 100	less than 100
9	OCl	1 day	less than 100	150,000
10	OCl	1 day	less than 100	9,600
11	OCl	1 day	less than 100	1,500

(1) One square inch of cloth shaken for 10 minutes in 100 ml. dilution water containing sodium thiosulfate before plating.

(2) Chlorinated rinse water contained between 100 and 200 p.p.m. available chlorine when fresh. Treated rinse water changed at 2 hour intervals.

(3) Counts made on Levine's Eosine Methylene Blue agar (Difco).

(4) Counts made on Tryptone glucose agar with bromcresol purple (NCA formula).

First, there are obvious economic advantages which favor the immersion type of washer. The cost of power, additional equipment and design becomes a factor, for the brush washer requires a motor plus some type of speed reduction drive to control the revolutions of the brush. Up-keep and depreciation also are factors which do not favor the brush type belt washer. In comparison, the design, construction, up-keep and depreciation of the immersion-type washer are most simple.

Another advantage which is related directly to sanitation strongly favors the immersion-type of belt washer. It sometimes becomes difficult if not impossible to keep the revolving brush clean and free from contaminating food debris and micro-organisms. Obviously, such a condition then completely nullifies any desirable effect which otherwise might be obtained.

An advantage of the immersion-type belt washer which may be discounted by some is that it can be operated with a small amount of water treated in any manner without requiring expensive dispensing apparatus. This is a distinct advantage for the smaller food plants and not without merit even for the larger plants where water consumption and disposal problems are acute.

In operation, the required amount of treatment of the water and the frequency of change have been observed to depend upon the purpose which the belt washer must accomplish. If the sole requirement is that the belt be clean and free from

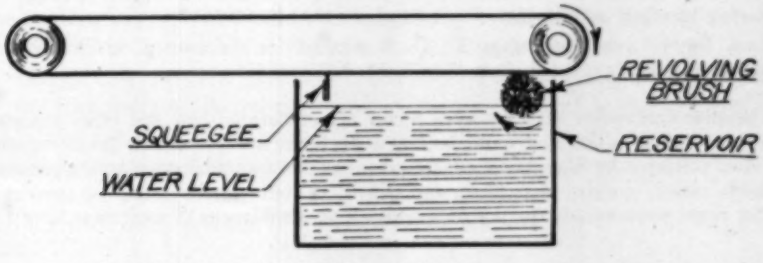

FIG. 2. A revolving brush type of continuous belt sanitizer.

unsightly accumulations of food debris and other foreign matter,[f] fresh water or, at most, a detergent treatment of the water is all that is required. If, however, the belt also must be kept relatively free from micro-organisms, as is the case in most instances, a sanitizing agent must be used.

However, unless the treatment of the water is subjected to routine control, the belt washer, regardless of type, can only contribute a false sense of security to the user.

SUMMARY

Data have been presented to show the effects of continuous sanitizing on control of micro-organisms on dried fruit processing equipment. An immersion-type belt washer has been described. The advantages and disadvantages of continuous belt treatment by various means have been discussed. It may be concluded that continuous sanitizing can be used to effectively control microbial contamination on such food processing equipment as place-packers' hand cloths and conveyor belts commonly used in the dried fruit industries.

ACKNOWLEDGMENTS

The technical assistance of Miss Thais Shearing and Mr. Joseph Tabachnick is gratefully acknowledged.

LITERATURE CITED

1. American Public Health Association, Standard Methods Committee for the Examination of Shellfish. Report . . . to the Committee on Research and Standards. *Am. J. Pub. Health*, **33**, 582 (1943).
2. American Public Health Association, Committee on Microbiological Examination of Foods, Report, 1946, *Am. J. Pub. Health*, **36**, 332 (1946).
3. Etchells, J. L., and Jones, I. D. Procedure for bacteriological examination of brined, salted and pickled vegetables and vegetable products. *Am. J. Pub. Health*, **36**, 1112 (1946).
4. Clague, J. A. Microbiological examination of dried foods. *Food Res.*, **1**, 45 (1936).
5. Kintner, J. H., and De Lay, P. D. Sanitation aspects of vegetable dehydration plants. *Army Vet. Bull.*, **37**, 12 (1943).
6. Vaughn, R. H., and Stadtman, T. C. Sanitation in the processing plant and its relation to the microbial quality of the finished product. *Food Freezing*, **1** (9) :334-336, 364, July (1946).
7. Vaughn, R. H., Stadtman, T. C., and Kueneman, R. W. Control of micro-organisms in frozen food plants. *Quick-Frozen Foods* **9** (2) : 76-78, 114 Sept. (1946).
8. Pederson, C. S. Significance of bacteria in frozen vegetables. *Food Res.*, **12**, 429 (1947).
9. Mrak, E. M. The deterioration of dates. *Rept. of the 18th Annual Date Growers Institute*, 3 (1941).
10. Whelton, R., Phaff, H. J., Mrak, E. M., and Fisher, C. D. Control of microbiological food spoilage by fumigation with epoxides. *Food Indus.*, **18**, 23; 174; 318 (1946).
11. Phaff, H. J., Mrak, E. M., Allemann, R., and Whelton, R. Microbiology of prunes during handling and drying. *Fruit Prod. J.*, **25**, 140 (1946).
12. Vaughn, R .H., and Stadtman, T. C. A method for the control of sanitation in food processing plants. *Am. J. Pub. Health*, **35**, 1292 (1945).

[f] The popular conception that the films which accumulate on belt and other equipment surfaces are composed of slime and mold implies that fungi are present in large numbers. Unpublished data collected by Vaughn et al. indicate that the microbial populations present in such accumulations mainly consist of bacteria and yeasts. Fungi (molds) may be present in small numbers but never predominate the populations until all semblances of sanitation have been lost.

SOIL TREATMENT FOR BETTER FOODS *

JACKSON B. HESTER
Campbell Soup Company, Riverton, N. J.

REVIEW PAPER

A general review of the influence of the various plant nutrients on the appearance and quality of several crops is given in this manuscript. Calcium content of plants can be increased by addition of calcium to the soil. Magnesium deficient plants are lacking in sugar and vitamin C. Plants with excessive nitrogen content have low vitamin C content. The importance of proper nutrient balance was indicated.

The acceptability of products by the industry and the consuming public is dependent upon a number of factors, no small part of which is influenced by the quality of the crop in the field. In other words, unless a satisfactory crop is grown, an acceptable product can not be delivered. It is the object of this discussion to point out the influence of the various elements of plant nutrition on the growth of the plant and acceptability of the plant product. Therefore, the influence of each element on the various factors, from the standpoint of quality, is to be discussed in order of their major differences.

CALCIUM AND MAGNESIUM

There is an ideal condition in the soil in which plants make optimum growth. This condition is dependent upon a number of factors, no small part of which is the soil reaction or calcium and magnesium supply. Although all soils differ in their chemical and mechanical conditions, the optimum growth is obtained for that condition in which the plant is most nearly supplied with a favorable nutrient content and water supply. It is difficult to discuss the nutrient supply of the soil by taking up the various elements one by one, because the addition of any element to the soil influences the availability of other elements in the soil. Furthermore, the nutrition of the various crops concerned varies greatly. For example, the soil conditions that represent a fertile soil for a Carolina tobacco grower are entirely different from those that represent a fertile soil for a Pennsylvania dairy farmer. Consequently, in a discussion of the influence of various elements on the growth and acceptability of a product by industry, the discussion must be predicated by the product to be grown. Much of the discussion concerned in this paper has to do with the production of tomatoes with an occasional illustration on the influence of various other crops. The primary function of calcium in the soil is the control of the soil reaction which, of course, influences the availability of phosphates, nitrogen, manganese, iron, etc. It is rare indeed that calcium deficiency occurs in soils. The principal use of calcium, under practical agricultural conditions, is to influence the availability of plant nutrients that are more expensive and less common.

The calcium content of plants can be greatly increased by the addition of calcium to the soil. This is important because it is difficult for the average individual to obtain enough calcium from average foods to supply the 0.8 grams per day required for normal functions of the average man. Given in Table 1 is the increase of calcium in okra by the application of lime to the soil.

The improper use of liming materials may result in mis-shapen carrots and other root crops as shown in Figure 1. This illustration is the result of liming a soil having a pH of 4.5 with 2000 pounds of hydrated lime and disking it in the top three inches

* Presented before the Eighth Annual I. F. T. Convention, Philadelphia, Pa., June 8, 1948.

TABLE 1

The Influence of Lime Upon Increasing the Calcium Content of Okra

Soil Treatment*	Calcium	
	%	Grams/lb.
No lime	0.74	0.33
3000 lbs. Dolomite/A	1.30	0.59

*Tifton sandy loam, Cairo, Georgia.

FIG. 1. Mis-shapen carrots, the result of the improper use of liming materials on extremely acid soil.

of soil. When the carrots came in contact with the acid soil, they did not develop properly.

Magnesium is an element that actually occupies a part of the chlorophyl molecule. Magnesium deficiency therefore results in the improper development of the green coloring matter of the plant, which in turn interferes with all normal functions of the plant. Products harvested from magnesium deficient plants are lacking in sugar content, vitamin C content, and other desirable qualities. See Table 2. There have been reported in the literature more than 125 cases of magnesium deficiency. Magnesium deficiency is very prevalent in the eastern part of the United States *(1)*. Figure 2 shows magnesium deficiency of corn. The green coloring matter in the mid-rib has not developed.

TABLE 2

Influence of Magnesium Deficiency on Quality of Tomatoes

	Yield tons/acre	Color	Ascorbic Acid*	Sugars†	Magnesium**
Deficient plant	7.6	C	265	28.4	14
Normal plant	10.8	A	326	48.2	44

*Parts per million of pulp (vitamin C).
†Grams per liter of pulp.
**Parts per million of pulp.

FIG. 2. Magnesium deficiency in sweet corn. Chlorophyl has not developed.

NITROGEN

Nitrogen has been described as the growth promoting element. Plants that have insufficient nitrogen are light yellow in color and low in protein content. The salability of leafy vegetables like spinach and various other leafy plants is directly dependent upon the dark green color (Figure 3). The dark green color is dependent

FIG. 3. Eight hundred bushels of good quality spinach with proper nitrogen fertilization.

upon the amount of available nitrogen in the soil. By and large, nitrogen is one of the elements that is more likely to be deficient in the average soil than any other element. Nitrogen deficiency in crops like tomatoes is more important than just the supplying of the dark green foliage. For instance, tomatoes that have insufficient nitrogen make insufficient growth and produce an unsatisfactory crop. Plants with an excessive amount of nitrogen are likely to be vegetative and produce an exceptionally large vine and an unsatisfactory crop. Furthermore, plants that have an excessive amount of nitrogen have a low vitamin C content *(2)*. Therefore, the proper fertilization of crops with nitrogen is very important from the standpoint of an acceptable product.

PHOSPHORUS

Phosphorus has been described as the keystone to agriculture. In other words, the importance of proper and adequate fertilization with phosphates has been a predominant factor in crop production. Without adequate phosphate plants are stunted, spindling, and fail to produce normal growth. From the standpoint of cabbage, cauliflower, etc. the plant is likely to be reddish in color and the consuming public is not likely to relish it.

POTASH

Potash in sufficient amounts for optimum crop production influences the quality of the crop in various ways. From the standpoint of tomatoes, the amount of yellow tops is very much increased by a lack of available potash in the soil. In an experiment conducted near Riverton, New Jersey, the amount of yellow top in tomatoes on potash deficient soil was 75 per cent, whereas adequately fertilized soil produced less than 2 per cent. Yellow tops (Fig. 4) in tomatoes increased the amount of

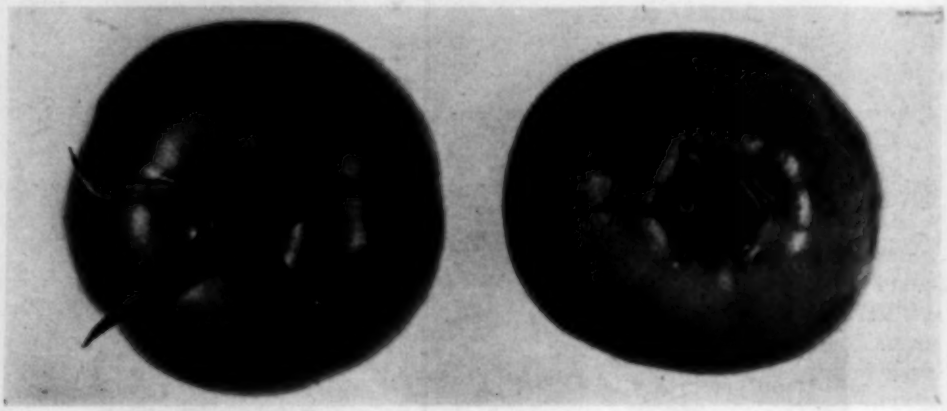

FIG. 4. Yellow tops in tomatoes increased by insufficient potash. Attractiveness of tomato is lowered and yield of pulp and the red color is decreased.

waste as well as depressed the deep red color and thus the acceptability of tomatoes by the canning industry. The manufacture of sugar in the leaves and the transfer of the sugar from the leaves to the fruit is very much influenced by the available potash in the soil. The development of potato tubers and roots is directly influenced by an adequate supply of potash.

SECONDARY ELEMENTS

The quality of crops is often influenced as much by the secondary elements as by the major plant food in the soil. Notably, in this connection, is the influence of the

element boron in the soil. The following characteristics of boron deficiency influence the acceptability of the product by industry which can not often be detected by an examination of the outside. Dark centers of rutabaga turnips (Fig. 5) are one of the characteristics of boron deficiency. Radishes also have dark centers and sweet potatoes a corky type of appearance. The hollow stems in broccoli, cabbage, etc. indicate boron deficiency. Corky core of apples, crack stem of celery, and black center of beets clearly emphasize the importance of this element. More and more soils each year are becoming deficient in boron. From 17 to 20 per cent of the New Jersey soils planted to tomatoes have boron deficiency.

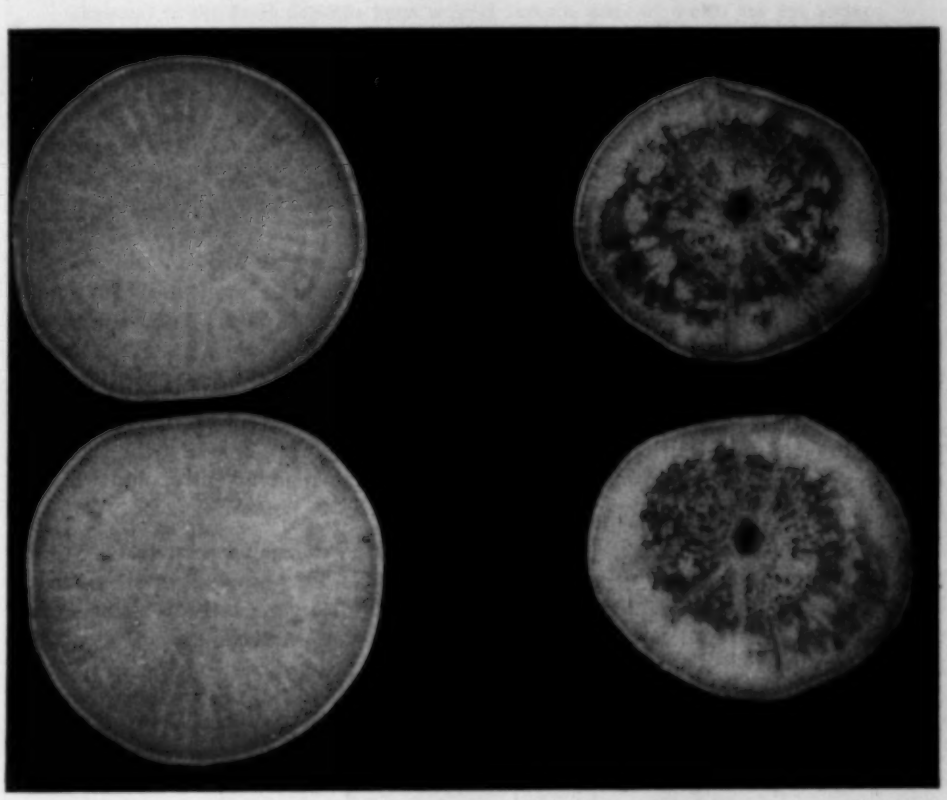

FIG. 5. The dark centers of the rutabaga turnips caused by insufficient boron.

Manganese is an important element and one of the most notable examples of this deficiency is in spinach. Spinach with insufficient manganese is yellow in color and the leaves are not properly developed. Of course the lack of manganese in various other crops is just as influential from the standpoint of appearance and growth.

Elements like iodine and cobalt are essential for the normal development of animal life, but apparently are not required by plants. However, foods carrying this element are highly desirable for man and other animals.

It is believed that the foregoing discussion emphasizes the importance of various plant nutrients in the production of satisfactory crops. It is also believed that as these elements become more depleted in the soil due to heavy cropping, erosion, etc., the more significant they will be as a factor in crop production. One needs to look no further than any grain field or pasture to note the tremendous difference in soil

fertility even from foot to foot. Many other cases of deficiencies and their influence on quality of food could be cited, but it is hardly necessary. The importance of proper soil treatment for acceptable foods can hardly be over-emphasized.

LITERATURE CITED

1. Hester, J. B., Smith, G. E., and Shelton, F. A. The relation of rainfall, soil type and replaceable magnesium to deficiency symptoms. *Proc.* A.S.H.S. **49**, 304 (1947).
2. Smith, G. E., and Hester, J. B. Calcium content of soils and fertilizers in relation to composition and nutritive value of plants. *Soil Science* **65**, 117 (1948).

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Legend: • = 70° F.; ○ = 90° F.; △ = 100° F. storage temperature.

BENZENE HEXACHLORIDE IN CANNED PEACHES*

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Results of experiments with peaches sprayed with gamma isomer benzene hexachloride indicate that the occurrence of the musty, off-flavor due to this chemical in the fruit depends upon several factors, some of which are not understood. The length of time between spraying and harvesting did not appear to be a deciding factor.

INTRODUCTION

Benzene hexachloride, one of the new insecticides, has a persistent odor that not only may make the taste of fresh fruit and vegetables objectionable but may be even more pronounced in the canned product. Snapp *(1)* believed that the flavor of fresh Georgia Belle peaches was not harmed when sprayed with one pound benzene hexachloride (3.79 percent gamma isomer) at "petal-fall" and three pounds at "shuck off," but that if two applications of benzene hexachloride were made of three pounds each, the latest a month before harvest, flavor was injured. Chandler *(2)* pointed out that a musty flavor could be detected in fresh peaches sprayed eight times with benzene hexachloride, six times in the first brood of plum curculio and twice in the late brood. Both Snapp and Chandler further suggested that benzene hexachloride is much less likely to be detected if dusted instead of sprayed. Chandler believed that if spraying with this material is discontinued at the end of the first brood period, the musty flavor may not be detected.

MATERIALS AND METHODS

Fruit from 22 three-year-old peach trees growing in the experimental plantings were selected at random from a block of seedling and named varieties of peaches that had received two benzene hexachloride spray applications for the control of plum curculio in place of the regular lead arsenate. This fruit ripened from August 2 to August 29, 1947, and included 17 seedlings and five named varieties, Golden Jubilee, Triogem, Early Hale Haven, Hale Haven and July Elberta (Tables 1 and 2). The rest of the normal spray schedule was followed without any benzene hexachloride. Three pounds of six percent gamma isomer benzene hexachloride per 100 gallons of water were applied in the "shuck spray," May 19, 1947. Three pounds of six percent gamma isomer benzene hexachloride, five pounds hydrated lime and five pounds wettable sulfur per 100 gallons of water were applied in the "first cover spray" June 6, 1947.

The fruits* were harvested when "tree ripe," held for one to 12 days in a household mechanical refrigerator, peeled in a five-percent lye bath, rinsed in an abundance of cold water, pitted, packed in No. 2 plain tin cans with 40° Balling sirup, processed in boiling water, cooled promptly to 100° F. or less, and stored in a cool cellar until sampled by a panel of seven staff members, April 28 and May 6, 1948.

In addition, a sample of commercially packed Elberta peaches that had not been sprayed with benzene hexachloride were included in one lot of peaches examined

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* Presented before the Eighth Annual I. F. T. Convention, Philadelphia, Pa., June 9, 1948.
*The writer thanks R. C. Moore, Station Assistant Horticulturist, for the samples of peaches that were canned.

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In addition, a sample of commercially packed Elberta peaches that had not been sprayed with benzene hexachloride were included in one lot of peaches examined

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on May 6, 1948 (Table 2). No member of the tasting panel was aware that this one sample had not been sprayed with benzene hexachloride, nor were they aware that all the other samples had been sprayed with benzene hexachloride.

To determine the limits of benzene hexachloride detectable in water to the tasting panel, benzene hexachloride was made up in concentration of one part per 100 million, one part per 10 million, five parts per million, one part per million, and one part per 100 thousand (Table 3). As a further check on the ability of the tasters to detect the presence or absence of benzene hexachloride, peach juice from one sample of commercially canned Elberta peaches that had not been sprayed with benzene hexachloride was divided into three samples. Benzene hexachloride was added to two samples in concentration of benzene hexachloride to peach juice of one part per million and five parts per million; the third sample served as a check. Results in Table 4 indicate that the tasters had no difficulty in detecting benzene hexachloride in the juice either by sense of smell or taste, or both, in a concentration of one part per million.

PRESENTATION OF DATA

Evidence of Benzene Hexachloride in Canned Peaches. Sample 6 in Table 1 of peaches harvested August 12, 1947 and canned August 17, 1947 was a soft, yellow freestone seedling. It was subacid, slightly astringent, with a thick, tough skin, and in 1947 it had a soft stem end. Evidence of contamination with benzene hexachloride in the canned product was observed in the odor and taste of the fruit. The odor was similar to that of benzene hexachloride spray. It persisted in the can after emptying. The taste was most disagreeable and the flavor of benzene hexachloride persisted in the mouth for some time.

Samples No. 1, 2, 4 and 5 of Table 1 were harvested at an earlier date than sample No. 6, yet evidence of benzene hexachloride was the least in these earlier harvested seedlings or varieties. Samples 9, 10 and 11 of Table 1 were rated on the average only slightly less objectionable, but were harvested and processed at a later date than sample No. 6. All samples, however, contained evidence of benzene hexachloride either by taste or smell.

TABLE 1

Canned Peaches Examined for Evidence of Benzene Hexachloride April 29, 1948[1]

Sample No.	Variety or Seedling No.	Harvest Date	Processing Date	Evidence of BHC Odor or Taste[2]
1	NF31-49	8/2/47	8/14/47	4
2	Golden Jubilee	8/5/47	8/12/47	4
3	Triogem	8/5/47	8/14/47	3
4	Early Hale Haven	8/5/47	8/14/47	4
5	C-29-128	8/8/47	8/15/47	4
6	C 29-89	8/12/47	8/17/47	1
7	C 30-14	8/12/47	8/12/47	2
8	C 30-106	8/22/47	8/27/47	2
9	NF30-79	8/26/47	8/30/47	3
10	28A-2	8/28/47	9/10/47	3
11	NF29-147	8/29/47	9/10/47	3
12	C35-47	8/29/47	9/10/47	2

[1] Fruit from trees that received benzene hexachloride, three pounds of six-percent gamma isomer per 100 gallons of water in shuck, May 19, 1947, and first cover, June 6, 1947, sprays.

[2] A rank of 5 would indicate no detectable evidence of benzene hexachloride odor or flavor, while 1 indicates evidence of very objectionable odor and taste of benzene hexachloride.

Sample 2, Table 2, was described by some of the tasting panel as "terrible." When divided into two parts and one part heated and allowed to cool, the odor became less objectionable, but the taste, particularly of the juice, was more musty and off-flavor while cold.

Evidence of benzene hexachloride contamination was reported in all samples in Table 2, except Sample 1. Unknown to the tasting panel, Sample 1, a commercial pack of Elbertas, was included. Not one of the panel reported any off-flavor or odor for this one sample.

Again there seemed to be no relationship between time of harvesting and evidence of benzene hexachloride in the canned product.

Benzene Hexachloride in Water. It will be observed that some individuals can detect benzene hexachloride in water in concentrations as low as one part per ten million, providing they can compare it with a water check (Table 3). In general, the

TABLE 2

Canned Peaches Examined for Evidence of Benzene Hexachloride May 6, 1948[1]

Sample No.	Variety or Seedling No.	Harvest Date	Processing Date	Evidence of BHC Odor or Taste[2]
1	Elberta	Commercial Packing Season of 1947		12
2	C 30-109	8/8/47	8/15/47	11
3	NF 30-142	8/22/47	8/27/47	10
4	NF 30-81	8/29/47	9/6/47	9
5	28A-2	8/28/47	9/10/47	8
6	NF 29-75	8/22/47	8/29/47	7
7	Early Hale Haven	8/5/47	8/14/47	6
8	July Elberta	8/6/47	8/13/47	5
9	Hale Haven	8/6/47	8/17/47	4
10	C 29-97	8/12/47	8/20/47	3
11 (heated)	NF 30-108	8/2/47	8/15/47	2
11 (cold)	NF 30-108	8/2/47	8/15/47	1

[1] Fruit from trees that received benzene hexachloride, four pounds of six-percent gamma isomer per 100 gallons of water in shuck, May 19, 1947, and first cover, June 6, 1947, sprays.
[2] A rank of 12 indicates no evidence of benzene hexachloride odor or flavor while 1 indicates very objectionable odor and taste of benzene hexachloride.

TABLE 3

Concentration of Benzene Hexachloride in Water Detectable to Tasting Panel

Taster No.	Concentration Detected By Smelling	Concentration Detected By Tasting
1	1 in 10,000,000	1 in 5,000,000
2	1 in 10,000,000	1 in 1,000,000
3	1 in 10,000,000	1 in 1,000,000
4	1 in 10,000,000	1 in 1,000,000
5	1 in 1,000,000	1 in 1,000,000
6	1 in 1,000,000	1 in 10,000,000
7	1 in 100,000	1 in 1,000,000

sense of smell seems more acute than the sense of taste for benzene hexachloride. Six of the seven tasters could taste benzene hexachloride in water in one part per million.

Benzene Hexachloride in Peach Juice. Further proof is offered that this sense of taste for benzene hexachloride in peach juice is just as acute as in water, because tasters could also detect benzene hexachloride in peach juice in one part per million (Table 4).

TABLE 4

Concentration of Benzene Hexachloride in Elberta Peach Juice Detectable to Tasting Panel

Taster No.	Concentration BHC Detected By Smelling or Tasting		
	5/1 million	1/1 million	None
1	Yes	Yes	No
2	Yes	Yes	No
3	Yes	Yes	No
4	Yes	Yes	No
5	Yes	Yes	No

DISCUSSION

It is reasonable to conclude that some other factor or factors than length of time between the last spray application of benzene hexachloride and harvest date may be more responsible for presence or absence of the objectionable odors and flavors in the canned fruit. This statement is made because canned fruit harvested August 2, (Table 1, Sample 1), contained only slight evidence of benzene hexachloride, and canned fruit harvested 10 days later, (Table 1, Sample 6), contained serious, objectionable evidence of benzene hexachloride, and canned fruit harvested on August 29, (Table 1, Sample 12), was only slightly less objectionable. All fruits examined had medium-tough to tough and medium-thick to thick skins; therefore it is not known whether any differences might exist accordingly to tendernes of skin, except to note that notwithstanding tough skins, objectionable, musty odors and flavors were present in the canned product. The mere fact that those samples judged most objectionable had soft stem ends may or may not be significant. In fact, the soft stem ends may have been the result of contamination with benzene hexachloride.

Canned peaches that had a musty, off-flavor associated with benzene hexachloride that were exposed to the open air for four hours, poured into quart jars and closed with a cap and kept in a 40° F. refrigerator for 48 hours when tasted again while cold, seemed to lose the off-flavor of the freshly opened canned peaches that originally were considered contaminated.

The musty odor associated with benzene hexachloride in canned peaches seemed less objectionable after reheating the fruit in an open pan; the undesirable taste, however, seemed worse after reheating. Benzene hexachloride was not detected by the author's family of three children and two adults in peach pie and cobbler made from canned peaches in which the musty taste and smell associated with benzene hexachloride were present in the canned product.

Also, it should be noted that there were some samples of canned peaches in which one or more of the tasting panel could not detect any off odor or taste, while other members reported a musty off-flavor or odor in the same samples. The one sample (Table 2, Sample 1) in which it was known that the peaches had not been sprayed with benzene hexachloride was scored free of any objectionable odor or taste, or both, by all members of the tasting panel, while all other samples in which benzene hexachloride was sprayed in two applications on the peaches were reported to have a musty odor or taste, or both, by the majority of the tasting panel.

SUMMARY

Canned peaches from 17 different seedlings and five named varieties, Golden Jubilee, Triogm, Early Hale Haven, Hale Haven and July Elberta, that had received the regular zinc-lead-arsenate-sulfur sprays, except that three pounds of six-percent gamma isomer benzene hexachloride per 100 gallons of water was substituted in the regular spray schedule in the "shuck" and "first cover" sprays, were examined

organoleptically for evidence of benzene hexachloride. As a check on the tasting panel, a single sample of canned Elberta peaches that had not been sprayed with benzene hexachloride was also included. The tests reported show that:

1. A musty, off-flavor was detected either by taste or smell, or both, by some of the tasting panel, but not by all members, in all samples of canned peaches that had been sprayed with benzene hexachloride.
2. No member of the tasting panel reported any musty, bitter or off-flavor in the one sample of canned peaches that had not been sprayed with benzene hexachloride. In fact, the tasting panel were led to believe that there might be several samples that had not been sprayed with benzene hexachloride.
3. Benzene hexachloride in water can be detected by smell in one part per ten million, and by taste in one part per million.
4. Benzene hexachloride added to canned peach juice in the laboratory can be detected readily by taste in one part per million.
5. There seemed to be little relationship between early harvested peach varieties or seedlings and amount of residual benzene hexachloride in the canned product detectable by taste or smell. Some of both early harvested and late harvested peach varieties were most objectionable, while the contrary was also true.

REFERENCES CITED

1. Snapp, Oliver I. "Benzene Hexachloride for Control of Plum Curculio on Peaches," *Journal of Economic Entomology*, Vol. 40, No. 3, June 1947.
2. Chandler, Stewart. "Plum Curculio Control with Chlordane and Benzene Hexachloride," *Down to Earth*, Vol. 4, No. 1, Summer, 1948.

STUDIES ON THE TOXICITY OF PROPYL GALLATE AND OF ANTIOXIDANT MIXTURES CONTAINING PROPYL GALLATE[a]

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Extensive toxicological studies are a prerequisite to the introduction in foods of new chemical preservatives, synthetic flavoring agents, coloring matter, etc. This paper reports studies undertaken on propyl gallate employing three species of animals, rats, guinea pigs and dogs, and extending over periods running from 14 months to 2 years. No toxicity was observed following the ingestion of amounts of propyl gallate equivalent to at least 100 times that which would be consumed if all dietary fat were treated with effective amounts of this antioxidant.

The use of antioxidants for the preservation of edible fats, certain lipid preparations, and fatty food products is becoming increasingly widespread. Incorporation of these substances in food preparations delays the development of rancidity; this is of importance not only from a commercial but also from a nutritional standpoint. Compounds which have been found to have sufficiently high antioxygenic value for use in foods are of widely different chemical structure and include nor-di-hydroguiaretic acid, ascorbic acid and its palmityl ester, alpha-tocopherol, and gallic acid and its esters (reviewed by Mattill) *(6)*. As a preliminary condition to the introduction of any of these compounds for general use in foods and medicinal products designed for human consumption, it is necessary that a thorough investigation be made for any possible toxic effects of the antioxidant. This paper reports the results of such an investigation of propyl gallate and of antioxidant mixtures containing propyl gallate.

The literature on the effects of administered propyl gallate and related compounds consists primarily in studies of its acute toxicity. Abderhalden *(1)* reported a very low degree of toxicity for gallic acid itself and Filomeni *(2)* found the minimum lethal dose of gallic acid administered intravenously to rabbits was 3.23 gm. per kilo body weight. Levi *(5)* reported that the isolated frog heart was reversibly stopped by gallic acid in a concentration of 1 part to 2500. Ethyl gallate, even in large doses, produces no symptoms of toxicity when injected subcutaneously into mice, Hilditch *(3)*. Thus the available information suggests that propyl gallate probably has a low toxicity.

The investigation of the toxicity of propyl gallate here reported was divided into two main portions: (1) "acute" studies in rats to determine the LD_{50} of propyl gallate when administered both orally and subcutaneously; (2) "chronic" studies to ascertain the effects of administering smaller amounts of pure propyl gallate and of antioxidant mixtures containing propyl gallate for periods varying from 1 to 2 years to 3 different species—rats, guinea pigs, and dogs. In these studies there was no evidence of toxicity for amounts at least one hundred times that which would be ingested by the human subject if all the fat in his diet were treated with an effective amount of the antioxidant.

EXPERIMENTAL

Acute Toxicity Studies in Rats. The acute toxicity of propyl gallate, of heated propyl gallate, and of antioxidant mixtures containing propyl gallate was determined by administration both intraperitoneally and orally (stomach tube) to adult, hooded

[a] Supported by a grant from The Griffith Laboratories, Inc., Chicago, Illinois.

and albino, male and female rats weighing between 250 and 400 grams. These rats had previously been fed a commercial laboratory ration and were fasted twelve hours previous to the antioxidant administration. No animal was included if the dose was not quantitatively given nor if visible regurgitation or other loss occurred.

The propyl gallate was prepared for injection by adding sufficient water to 20 gm. of solid propyl gallate to bring the total volume to 100 cc., and then homogenizing the mixture in a Waring Blendor. Administered volumes of this solution were corrected for the amount of air entrained during the mixing process. In order to simulate conditions encountered on cooking and baking, the toxicity of a sample of propyl gallate previously heated for one hour at 425-450° F. in an oil bath was also determined. Some decomposition occurred during the period of heating as evidenced by the preparation becoming a light brown color. The dosage at which 50 percent of the animals died (LD_{50}) was the same (3.8 gm. per kilo, Table 1)

TABLE 1

Determination of LD_{50} of Propyl Gallate in Rats

Oral Administration					Intraperitoneal Administration		
Amount (gm. per kilo Body Weight)	Unheated Propyl Gallate		Heated Propyl Gallate*		Amount (gm. per kilo Body Weight)	Unheated Propyl Gallate	
	No. of Animals	No. of Deaths	No. of Animals	No. of Deaths		No. of Animals	No. of Deaths
5.0	6	6	10	8	0.5	6	6
4.0	18	12	10	6	0.4	18	12
3.5	18	5	10	4	0.35	18	5
3.0	12	0	14	4	0.30	12	0
2.5	2	0			0.25	2	0
2.0	9	0			0.20	9	0

*Heated at 425-450° F. for 1 hour.

with heated and unheated samples of propyl gallate; apparently heating does not alter the toxicity of the substance. When administered intraperitoneally, the LD_{50} was one-tenth as high (0.38 gm. per kilo) as when administered orally.

In the fatal cases, following the administration of pure propyl gallate, the time and cause of death appeared to be independent of whether the heated or unheated substance was administered, and of the mode of administration. It usually occurred within 10 to 60 minutes and appeared to be due to asphyxia or cardiorespiratory failure as evidenced by gasping respiration and convulsions before death. Autopsy revealed no abnormalities other than general dilatation and engorgement of both visceral and peripheral blood vessels and sometimes inflation of the lungs. The adrenal glands were particularly hyperemic and the vessels leading to them were markedly engorged with blood.

The acute toxicity of propyl gallate was also studied when it was administered together with other substances in an oily medium (results not shown in the table). A preparation containing 9.16 percent propyl gallate, 6.16 percent citric acid and 30 percent lecithin in corn oil, heated together to 165° C. to effect solution was administered by mouth in an amount (4.2 cc. per 100 gm. body weight) which contained the oral LD_{50} dose of propyl gallate as previously determined. Of thirteen successful administrations, only two animals died within 24 hours; the remaining animals fully recovered within several days. Apparently the oil decreased the rate of absorption of the propyl gallate.

Chronic Toxicity Studies in Rats. Weanling (21-23 day-old) albino male and female rats of the Connecticut Agricultural Experiment Station strain were placed

in individual wire mesh-bottom cages in a room maintained at 78° ± 3° F. and were fed an adequate basal synthetic diet of the following composition:

Casein	20 percent
Sucrose	10 percent
Dextrin (white)	35 percent
Crisco	21 percent
Wesson's Salt Mixture	4 percent
Standardized Cod Liver Oil	5 percent
Dried Brewer's Yeast	5 percent

The rats were divided into ten different groups. The above synthetic diet without supplementation was fed to the control group. The diets fed the other groups of rats were supplemented with various levels of propyl gallate, antioxidant mixture (containing propyl gallate, lecithin, and corn oil) and heated antioxidant mixture (Table 2). The "low" level of propyl gallate (0.00117 percent) was arbitrarily chosen as that amount which would be present in the diet if all the fat of the diet [assuming 23.3 percent fat, the average consumed by the Army during the war—Howe *(4)*] were treated with the recommended amount (0.25 percent) of a commercial antioxidant mixture which contains 2 percent propyl gallate. The "low" level of antioxidant mixture contained this same amount of propyl gallate. The ten-fold successive increases in the "medium," "high," and "sub-acute" levels were also arbitrarily adopted. Even the low level is purposely an exaggeration of the

TABLE 2

Supplements Added to the Various Diets

Group	Number of Rats	Supplement to Basal Diet
Control	15 males, 15 females	None
Propyl Gallate—"Low Level"	10 males, 10 females	0.00117% Propyl Gallate
Propyl Gallate—"Medium Level"	10 males, 10 females	0.0117% Propyl Gallate
Propyl Gallate—"High Level"	10 males, 10 females	0.117% Propyl Gallate
Propyl Gallate—"Sub-acute Level"	10 males, 10 females	1.17% Propyl Gallate
Propyl Gallate—"Sub-acute Level"	10 males, 6 females	2.34% Propyl Gallate
Antioxidant Mixture—"Low Level"	10 males, 10 females	0.06% Antioxidant Mix.*
Antioxidant Mixture—"Medium Level"	10 males, 10 females	0.6% Antioxidant Mix.*
Antioxidant Mixture—"High Level"	3 males, 7 females	6.0% Antioxidant Mix.*
Heated Antioxidant Mixture—"High Level"	5 males, 5 females	0.6% Heated Antioxidant**

*Replacing an equivalent amount of Crisco in the basal diet.
**Antioxidant mixture fortified with 17.4% propyl gallate heated at 425-450° F. for one hour.

amount which might be consumed by human subjects since undoubtedly only a small portion of the total dietary fat would be treated with the antioxidant mixture. The "sub-acute levels" would thus represent more than one thousand and two thousand times, respectively, the level which might be consumed by human subjects.

All rats were placed on their respective diets at weaning, with the exception of the group fed the high level of antioxidant mixture. These rats were placed on this diet at an age of 18 weeks, after receiving 1.17 percent propyl gallate from weaning. With the exception of this group and of several rats sacrificed for histological tissue studies, all animals were continued on their respective diets until death or for a two-year period.

TABLE 3

Growth of Male Rats Fed Diets Containing Various Levels of Propyl Gallate

Age of Rat	Amount of Propyl Gallate Added to Diet											
	None (Control)		0.00117% Propyl Gallate		0.0117% Propyl Gallate		0.117% Propyl Gallate		1.17% Propyl Gallate		2.34% Propyl Gallate	
	No. of Animals	Mean Weight*	No. of Animals	Mean Weight*	No. of Animals	Mean Weight*	No. of Animals	Mean Weight*	No. of Animals	Mean Weight*	No. of Animals	Mean Weight*
Weeks		*gm.*		*gm.*		*gm.*		*gm.*		*gm.*		*gm.*
4	15	59 ± 1.5	15	59 ± 2.1	9	59 ± 3.3	7	62 ± 4.1	10	53 ± 3.1	10	52 ± 1.5
6	15	127	15	124	10	121	7	121	8	57	8	45
8	15	211	15	208	10	204	7	198	7	75	6	60
10	15	282	15	264	10	276	7	274	6	105	6	81
12	15	339 ± 12	15	350 ± 11	10	328 ± 10	7	331 ± 17	6	142 ± 13	6	101 ± 6.9
14	15	381	15	391	10	376	7	373	6	177	6	120
16	14	421	15	434	10	405	7	413	6	214	6	140
18	15	444	14	465	10	435	7	441	3**	247	6	158
20	15	468	15	478	10	457	7	462	3	273	6	168
24	15	499 ± 17	15***	522 ± 20	10	487 ± 9.7	7	498 ± 24	3	331 ± 36	6	193 ± 22
28	15	529	10	557	10	495	7	530	3	359	6	206
32	15	540	9	593	9	539	7	555	3	389	6	230
36	14	553	9	608	9	556	7	562	3	408	5	241
39	14	559 ± 18	9	625 ± 30	9	554 ± 10	6	602 ± 43	3	431 ± 8	5	247 ± 17
43	14	572	8	625	9	579	5	636	3	440	5	266
47	13	581	6	620	8	596	5	658	3	445		
51	13	572	6	617	8	602	5	681	3	432		
55	11	550 ± 24	4	657 ± 50	8	583 ± 30	5	689 ± 34	3	422 ± 30		
59	9	547	4	684	7	572	4	692	2	431		
63	8	585	4†	708	6	564	4	695	2	473		
67	6	619			4	612	7†	740	2	445		
71	5	613 ± 50			2	634 ± 21	7	762 ± 54	2††	432		
75	4	624			2	627	7	754				
79	3	613			1	615	4	786				
83					1	570	1	855				
85							1	800				

*Variations give mean deviation of the mean. **3 animals changed to 6% antioxidant mixture on 18th week. ***5 animals changed to heated "antioxidant mixture" diet on 26th week. †animals changed from 0.00117% to 0.117% propyl gallate on 63rd week. ††sacrificed for tissues.

The growth of the rats was followed by weekly weighings during the first year of the experiment and bi-weekly weighings during the second year of the experiment. Because of lack of space, the growth for only one sex is presented for each antioxidant preparation, arbitrarily, for male rats for the groups receiving propyl gallate (Table 3), and for female rats for the groups receiving antioxidant mixture (Table 4). With the exception of the rats given "sub-acute levels" of propyl gallate (1.17 and 2.34 percent) growth of all animals receiving the antioxidant-containing diets was at least equal to that of the control animals.

The somewhat higher values of the mean weights of the rats receiving antioxidant supplements may be due to some protective action of the antioxidant on the fat or perhaps some other dietary constituent. Since food was not allowed to stand in the feeding cups for periods longer than 5 days, the difference would not appear to be due to development of rancidity in the control diet before the food was eaten.

Rats fed diets containing 1.17 percent and 2.34 percent levels of propyl gallate were definitely stunted in their growth (Table 3). At these levels, propyl gallate imparts a distinctly bitter taste to the diet, and the stunted growth may be due to a resultant lowered food consumption. Rats which were stunted in growth by the 1.17 percent level of propyl gallate in the diet resumed a more normal growth rate when they were transferred at 18 weeks of age to a diet containing 6 percent antioxidant mixture (Table 4), Ten animals were transferred at the 26th week from the

TABLE 4

Growth of Female Rats Fed Diets Containing Various Levels of "Antioxidant Mixture"

Age of Rat (Weeks)	Amount of Antioxidant Mixture Added to Diet							
	None (Control)		0.06 Per Cent		0.60 Per Cent		6.0 Per Cent	
	No. of Animals	Mean Weight*	No. of Animals	Mean Weight*	No. of Animals	Mean Weight*	No. of Animals	Mean Weight*
		gm.		*gm.*		*gm.*		*gm.*
4	15	60 ± 1.5	8	51 ± 1.4	7	56 ± 5.0		
6	15	123	10	113	9	110		
8	15	174	10	167	9	166		
10	14	215	10	211	9	204		
12	14	242 ± 5.7	10	237 ± 5.6	9	230 ± 6.3		
14	14	263	10	268	9	255		
16	14	278	10	278	9	272		
20	14	301	10	307	9	302	7**	214
24	14	324 ± 8.6	10	324 ± 6.0	9	337 ± 8.0	7	246 ± 8.0
28	13	331	10	339	9	357	7	273
32	13	345	10	359	9	379	7	294
36	13	360	10	363	9	386	7	314
39	11	361 ± 7.3	10	370 ± 6.8	9	397 ± 16	7	313 ± 18
43	11	366	9	375	8	420	7***	313
47	10	380	8	370	6	430		
51	7	388	8	381	5	464		
55	7	392 ± 21	8	400 ± 21	5	468 ± 34		
59	7	405	7	402	5	460		
63	7	416	6	426	5	469		
67	7	433	6	450	5	476		
71	7	438 ± 23	4	458 ± 30	4	504 ± 60		
75	5	436	4	462	2	505		
79	2	525	3	490	2	500		
83	1	520	2	525	1	650		
87			1	458				
107			1***	480				

*Variations give mean deviation of the mean. **Rats fed from weaning to 18th week a diet containing 1.17% propyl gallate. ***Sacrificed for tissue studies.

diet containing 0.00117 percent propyl gallate to a diet containing 0.6 percent "heated antioxidant mixture" fortified with propyl gallate (see Table 2). No change in the rate of growth (data not included in tables) was noticed during the subsequent four weeks, when the animals were sacrificed for the study of tissues.

Except for those animals stunted in growth by the high levels of propyl gallate in the diet, there was no detectable effect of either the antioxidant mixture or of propyl gallate on gross appearance. "Growths" were found only in three groups—one rat receiving the control diet, four rats receiving the diet treated with 0.6 percent antioxidant mixture, and one rat receiving the diet containing 0.00117 percent propyl gallate. The "growth" in the control rat was found histologically to be a hyperplastic lymph node probably related to an extensive pulmonary carcinoma found on autopsy. The "growths" in two of the antioxidant-fed rats were found histologically to be enlarged lymph nodes; the third growth was an actively secreting mammary gland and the fourth consisted of collagenous connective tissue. The remaining growth from the rat fed a diet containing 0.00117 percent propyl gallate was not identified.

It is evident from the data in Table 5 that there is no consistent difference between the hemoglobin values for the animals fed the control diet and the animals

TABLE 5

Hemoglobin Levels of Rats Fed Antioxidant Supplemented Diets

Diet	Mean Hemoglobin Level at Age*				
	6 Weeks	14 Weeks	60-65 Weeks	65-70 Weeks	70-80 Weeks
	gm. %	*gm. %*	*gm. %*	*gm. %*	*gm. %*
Control	12.3 ± 0.4	15.2 ± 0.5	14.3 ± 0.4	14.6 ± 0.7	14.2 ± 0.4
0.00117% Propyl Gallate			14.6 ± 0.4		
0.0117% Propyl Gallate			13.9 ± 1.0	11.9 ± 0.8	12.1 ± 0.7
0.117% Propyl Gallate			13.3 ± 0.7	14.6 ± 0.8	13.8 ± 0.5
1.17% Propyl Gallate	13.0 ± 0.4	10.9 ± 0.4	10.9 ± 2.0	12.1 ± 1.0	13.7 ± 1.3
2.34% Propyl Gallate	13.4 ± 0.4	11.1 ± 0.3			
0.06% Antioxidant Mixture			13.4 ± 0.4	13.3 ± 0.6	14.2 ± 0.5
0.6% Antioxidant Mixture			14.5 ± 0.4	13.5 ± 0.6	13.8 ± 0.4

*Variations give mean deviation of the mean.

fed the supplemented diet with the lower levels of antioxidant. However, animals fed diets containing "sub-acute levels" of propyl gallate had significantly lower hemoglobin levels during the early part (to 65 weeks of age) of the experiment when there were sufficient animals to yield a reliable mean value. As the animals became older the hemoglobin values appeared to increase toward normal levels. Low hemoglobin levels were encountered in the heavier rats of all groups and appeared to be attributable to chronic blood loss from lesions on the feet caused by standing on the wire screen bottoms of the cages.

Additional hematological data were obtained which are not included in the tables. Erythrocyte counts in the majority of the animals varied directly in all cases with hemoglobin levels. Leucocyte counts on 27 selected rats fed the various diets showed no significant difference with respect to either the total leucocyte count or to the differential count.

Animals which died during the course of the experiment and those which were purposely sacrificed were examined histologically. No consistent pathological changes attributable to antioxidant supplementation were found in the heart, lung, liver, spleen, or gonads of the animals given any of the diets studied. The only consistent abnormality apparent was in the kidneys of the animals fed "sub-acute

levels" (1.17 percent and 2.34 percent) of propyl gallate. Gross examination showed a mottled appearance. Histological examination showed tubular damage and the presence of albuminous casts. It appears that these changes could have been due to severe inanition and a consequent lack of dietary choline and methionine.

The direct cause of death in practically all animals which succumbed during the experiment was respiratory infection. A frequent contributory cause of death especially in the older rats was the presence of large hair balls in the stomach, causing anorexia and a resulting lowered resistance. An examination of the tables shows that, except for the rats fed diets containing "sub-acute levels" of propyl gallate, the mortality was about the same in all groups.

Chronic Toxicity Studies in Guinea Pigs. Young male and female guinea pigs three to four weeks old and weighing between 200 and 300 grams were divided into two groups each comprised of 14 males and 6 females. The animals were housed in large size wire mesh-bottom cages, two or three animals to the cage, and separated as to sex. All animals were given cabbage three times weekly. Animals in the control group were fed Purina Rabbit Chow *ad libitum* and the animals in the experimental group were fed the same ration previously impregnated with propyl gallate. Pellets were impregnated with propyl gallate by spraying them with an alcoholic solution containing sufficient propyl gallate to give a final concentration equal to the "medium level" of the preceding studies on rats (0.0117 percent).

The body weights of the animals were determined weekly for a period of one year. At the end of this time, the female animals in each group were mated with male animals of the same group. As the experiment was completed, the animals were killed, checked at autopsy, and sections were prepared for microscopic examination.

There was no detectable effect of the propyl gallate on the gross appearance of the animals. Neither did it have any influence on their rate of growth (Table 6). Only one litter of three offspring was obtained from the six control female guinea

TABLE 6

Growth of Guinea Pigs Fed Control and Propyl Gallate-Treated Diets

Weeks on Experiment	Control Diet		Propyl Gallate-Treated Diet	
	Mean Weight* (14 males)	Mean Weight* (6 females)	Mean Weight* (14 males)	Mean Weight* (6 females)
	gm.	*gm.*	*gm.*	*gm.*
0	259 ± 13	211 ± 11	251 ± 11	207 ± 15
2	338	275	325	264
4	443	377	434	340
6	554	442	548	420
8	647 ± 18	493 ± 27	639 ± 14	489 ± 28
10	726	560	731	548
12	772	569	759	570
14	851	644	830	647
16	897 ± 25	675 ± 24	865 ± 19	677 ± 41
20	954	718	925	716
24	1023	780	1011	790
28	1085	830	1075	859
32	1066 ± 23	838 ± 42	1095 ± 40	872 ± 54
36	1102	881	1120	845
40	1125	881	1139	864
44	1182	883	1160	896
48	1210 ± 26	921 ± 40	1202 ± 33	947 ± 61
52	1190	932	1202	972

*Variations give mean deviation of the mean.

pigs, while three litters of three pigs each were obtained from the six propyl gallate-fed guinea pigs. The growth of the litter of the control animal and of one of the litters of the propyl-gallate-fed animals was followed for two months, without detecting any significant difference.

No gross abnormalities attributable to propyl gallate feeding were found at autopsy. Histological examination of liver, kidney, spleen, testes and ovary, adrenal, heart and lungs also showed no pathology attributable to propyl gallate.

Chronic Toxicity Studies on Dogs. Twelve young female mongrel dogs weighing from 4.6 to 15.0 kilos were divided into two groups and housed in indoor pens having access to outdoor runways. Animals in the control group (5 dogs) were fed untreated commercial dog chow pellets and those in the experimental group (7 dogs) were fed pellets previously treated with propyl gallate as already described. As a supplement to this diet a mixture of cod liver oil and dried brewer's yeast was given each week to all animals.

Throughout the course of the experiment, which lasted for 14 months, there was no evidence of any toxic effect of the propyl gallate. The groups could not be differentiated on the basis of appearance, activity, or other gross characteristics. Both the control and propyl gallate-fed dogs increased somewhat in weight during the experiment, probably because of improved food and housing conditions. Terminal hemoglobin values determined on the dogs of both groups showed no significant difference. Qualitative urine analyses also performed at the end of the experiment showed no more than a questionable trace of glucose, acetone-bodies, blood, bile, or protein in any animal. The absence of color in Gerhardt's ferric chloride test for aceto-acetic acid not only indicated the absence of aceto-acetate, but also the absence of detectable quantities of propyl gallate in the urine. The specific gravity of urine samples collected after 12-hour periods in which the animals were deprived of water, showed no significant difference. There is thus no suggestion of any abnormality due to propyl gallate feeding, in renal or hepatic function or of any detectable metabolic aberration.

SUMMARY

The LD_{50} of propyl gallate administered to rats orally is approximately 3.8 grams per kilo body weight and administered intraperitoneally is 0.38 grams per kilo. Death from this dose occurs usually within an hour and is due to cardiorespiratory failure. Heating propyl gallate at 425° to 450° F. for one hour has no effect on the LD_{50} or on the toxic manifestations.

The feeding of "sub-acute levels," 1.17 and 2.34 percent, of propyl gallate to rats results in inhibition of growth and a mild anemia probably due to the bitterness of the diet with a resulting low food intake. Death occurred within four weeks in about 40 percent of the animals fed the higher level. The only consistent pathological change found is tubular damage and the presence of albuminous casts in the kidney. Surviving rats have consumed the above amounts of propyl gallate for 10 to 16 months without visible toxic effect other than inhibition of growth.

The prolonged feeding of varying amounts of propyl gallate (0.00117 percent, 0.0117 percent, and 0.117 percent) or of antioxidant mixture (0.06 percent, 0.6 percent, and 6.0 percent) or of heated antioxidant mixture (0.6 percent) for as long as two years to rats or for 14 to 15 months to guinea pigs (0.0117 percent propyl gallate) and dogs (0.0117 percent propyl gallate) had no detectable effect on gross appearance, growth or body weight, reproduction (guinea pigs), hemoglobin, erythrocyte, or leucocyte levels in blood (rats), renal function as reflected by the

qualitative composition of the urine (dogs), or histological appearance of the liver, kidney, spleen, stomach, gonads, lungs, and heart (rats and guinea pigs).

These results thus show that no detectable toxic effects follow the prolonged ingestion of propyl gallate or of antioxidant mixture when these substances are ingested in amounts at least 100 times that which would be consumed by human subjects if all the dietary fat were treated with the effective recommended amounts of propyl gallate or of antioxidant mixture.

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LITERATURE CITED

1. Abderhalden, E. *Biochem. Handlexikon.*, Bd. VII, 15. Berlin (1912).
2. Filomeni, M. The pharmacology of gallic acid. I. Immediate toxicity of gallic acid introduced intravenously and the anatomicopathological lesions of the organs. *Arch. Pharm. sper.*, **63**, 183-192; *C. A.*, **31**, 6730 (1937).
3. Hilditch, T. P. Some factors affecting the control of oxidative rancidity. *Chemistry and Industry*, 67-71 (1944).
4. Howe, P. E. Nutritional aspects of feeding the army. *J. Am. Med. Assoc.*, **120**, 93-96 (1942).
5. Levi, A. Action of gallic acid on frog heart. *Arch. pharm. sper.*, **61**, 81-87; *Physiol. Abs.*, **21**, 585 (1936).
6. Mattill, H. A. Anti-oxidants and synergists. *Oil and Soap*, **22**, 1-3 (1945).

THE ROLE OF MONOSODIUM GLUTAMATE IN THE SEASONING OF CERTAIN VEGETABLES *

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Most vegetables, raw or cooked, were found to be markedly improved in flavor by the addition of monosodium glutamate as a seasoning. The principal effects noted were balancing, blending, and reinforcement of the natural flavors and suppression of sourness, rawness, earthiness, and certain other undesirable notes. In the concentrations needed for this work, the presence of glutamate was scarcely noticeable.

Interest in glutamic acid, and especially in its monobasic salt, monosodium glutamate, has been long maintained in our laboratories. During the past two years we have made an intensive study of the effects of this remarkable substance in foods, particularly in vegetables, and our findings are reported herewith for their general interest.

The early forms of monosodium glutamate were crude and variable. With advances in food technology and the application of scientific methods to its production, monosodium glutamate has become an increasingly purer product, until today the commercial article is a chemically-pure, white, crystalline substance having practically no odor. It has a persistent taste, primarily sweet and salty, and imparts a mouth-filling sensation. When tasted in quantity, it produces a slight tingling on the tongue, especially near the tip. In water solution, the taste threshold is about one part in three thousand.

Monosodium glutamate is probably best classified as a seasoning agent; its unique action being more of the salt type than the condiment type *(1)*. Its compatilibility with meats is well known through extensive use in food products containing meats, but, by contrast, knowledge of its action in vegetables is meager. Consequently, our food study has been centered on the common vegetables to determine whether or not monosodium glutamate is complimentary to their flavor and to ascertain the specific effects of its use.

FLAVOR PANELS

Since all the information reported in this study was gained through the use of an organoleptic laboratory panel, it is perhaps fitting to refer briefly to panels. An organoleptic panel is a group of individuals who judge the quality of a product through use of their senses of feeling, smelling and tasting. The psychic aspects of food and flavor appreciation, no doubt, involve, all of the senses. There are three general types of panels: consumer, expert, and laboratory.

Consumer panels are used to obtain the public reaction to a food commodity, where tasting is usually done in the home. Results are obtained by analysis of the overall subjective impressions that the food creates due to flavor, texture, and many other factors.

Expert panels, such as the United States Board of Tea Experts, are composed of individuals or small groups highly skilled in evaluating one particular commodity.

Laboratory panels consist of trained individuals of tested sensitivity who work independently under favorable conditions. Their findings are considered objective when based on careful comparisons against standards. Usually, panel workers evaluate specific points of differences between a standard and the material under consideration. The usual means of obtaining familiarity with a new product is

* Presented before the Eighth Annual I. F. T. Convention, Philadelphia, Pa., June 9, 1948.

afforded the taster by "open panel" sessions. Such orientative sessions are informal meetings where the article to be tested is examined and discussed. The free discussion helps to develop a specific vocabulary applicable to the characteristics of the particular food and fosters exchange of ideas and a focusing of attention on the points of specific or critical interest. In a "closed panel," the members individually examine the article, without discussion, and report their findings.

TECHNIQUE OF TESTING

Raw and cooked fresh, canned, and frozen vegetables were examined. Not all varieties of each vegetable were studied, nor were most samples in prime condition, as many were obtained in the retail market. In every case, all variables besides the effect of glutamate were controlled as well as possible. For example, if broccoli was to be tested, several heads of fresh broccoli were cleaned, cut up and boiled in glass until nearly cooked. Then sub-samples were prepared in one-liter beakers by taking aliquots of the broccoli and cooking water. Glutamate, calculated on the weight of the broccoli, was added in various proportions to all but the control samples. Then cooking was completed, long enough to assure good blending. Samples were presented to the panel seated at a circular, freely-revolving table. Aromas in the beakers were observed by all members who individually wrote down their findings. Then each individual was served with portions from the various lots. The silver and china used had previously been cleaned and oven-baked to insure freedom from aroma. After tasting the samples, the panel members again recorded their findings. Then discussion followed.

In the orientative work with each vegetable, preliminary tests were made with one or two tasters to ascertain the minimal effective amount of glutamate; in other words, the smallest amount of glutamate that would just produce an effect in the food to which it was added. Then the food under consideration was prepared and served to the panel for evaluation and estimation of compatibility. No other seasoning was added during the orientative tests.

Following the orientative work, confirmatory tests were made by a larger panel on the same vegetables. In this instance four sub-samples were examined. The first was an unseasoned control, the next was the otherwise unseasoned sample treated with glutamate, the third was a fully seasoned control, and the fourth was fully seasoned plus glutamate. By this time, it was usual for the panel members to characterize the aroma and the taste of each unseasoned vegetable. For example, the aroma of one sample of canned peas was given the following description; for aroma: pea-like, fragrant, beany, burnt; and for flavor by mouth: sweet, eggy, and sour, with bitter aftertaste. The effect of adding seasoning to these peas could then be observed in detail, particularly the effect of glutamate on the individual characteristics noted of each vegetable, with and without other seasoning agents.

Further tests were made on a series of conventionally seasoned vegetables. Each vegetable was subdivided into several test samples: fully-seasoned control; fully-seasoned samples containing minimum effective quantity of monosodium glutamate; and several fully seasoned samples containing increasing amounts of glutamate. The latter were prepared in order to ascertain the maximum tolerable amounts or the greatest quantity of added glutamate which would just not superimpose its own character on that of the cooked vegetable under study.

Perhaps the least scientific but most practical method for the purpose was that of evaluating the compatibility of monosodium glutamate with raw vegetables. A few of the commonly used salad vegetables were cleaned and cut into thin slices. Each panel member was furnished with shakers, one filled with table salt and the

other with monosodium glutamate, for seasoning the raw vegetables. To further evaluate the effect on raw vegetables, tossed salads were prepared with mayonnaise containing monosodium glutamate.

FINDINGS

In every instance it was found that glutamate altered the character of cooked vegetables by blending the components of aroma and taste into a smoother flavor.

Table 1 lists the raw vegetables seasoned with glutamate. When used in conjunction with salt, glutamate was found compatible with most of the raw vegetable slices tested. In the tossed salads prepared with mayonnaise monosodium glutamate was thoroughly compatible and produced interesting results. Tables 2, 3 and 4 present the vegetables we examined cooked fresh, cooked canned, and cooked frozen. A range of proportions of glutamate used is given for each cooked vegetable. The lower figure represents the minimal effective amount of glutamate and the higher figure the tolerable amount or the most that could be added without disguising the identity of the vegetable.

By adding monosodium glutamate in gradually increasing amounts beyond the minimum effective quantity, an increase in the effect was perceived up to the point

TABLE 1

Monosodium Glutamate Used on Raw Vegetables

Vegetable	Proportion of Glutamate Used
	%
Cabbage	about 0.2
Carrots	about 0.2
Celery	about 0.2
Lettuce	about 0.2
Radishes	about 0.2*
Tomatoes	about 0.2

*Of questionable compatibility.

All tasted in conjunction with salt.

TABLE 2

Monosodium Glutamate Cooked With Fresh Vegetables

Vegetable	Range of Useful Proportions
	%
Asparagus	0.5 – 3.0
Beans, green	0.1 – 0.2
Beans, lima	0.3 – 0.4
Beets	0.1 – 0.5
Broccoli	0.5 – 1.0
Cabbage	0.2 – 0.3
Carrots	0.2 – 2.0
Cauliflower	0.5 – 1.0
Celery	0.1 – 0.2
Corn	0.1 – 1.0
Mushrooms	0.1 – 1.0
Peas	0.2 – 2.0
Potatoes, sweet	0.1 – 0.2
Potatoes, white	0.2 – 1.5
Spinach	0.2 – 3.0
Squash, summer	0.5 – 1.0
Squash, winter	0.2 – 1.0
Tomatoes	0.1 – 0.3
Turnips, yellow	0.2 – 0.3

TABLE 3

Monosodium Glutamate Cooked With Canned Vegetables

Vegetable	Range of Useful Proportions
	%
Asparagus	0.1 – 1.0
Beans, green	0.2 – 1.0
Beans, lima	0.1 – 02
Beansprouts	0.05– 0.1
Beets	0.1 – 0.5
Carrots	0.2 – 1.0
Corn, whole kernel	0.2 – 0.75
Corn, cream style	0.1 – 0.25
Hominy	not compatible
Mushrooms	0.1 – 1.0
Peas	0.1 – 1.0
Potatoes, sweet	0.1 – 0.3
Potatoes, white	0.1 – 0.3
Sauerkraut	0.1 – 0.2
Squash, winter	0.1 – 0.3
Tomatoes	0.1 – 0.3
Tomatoes, juice (not cooked)	0.2 – 3.0

TABLE 4

Monosodium Glutamate With Cooked Frozen Vegetables

Vegetable	Range of Useful Proportions
	%
Asparagus	0.5 – 1.0
Beans, green	0.1 – 0.2
Beans, lima	0.1 – 0.2
Broccoli	0.5 – 1.0
Cauliflower	0.1 – 0.2
Corn, whole kernel	0.1 – 0.3
Peas	0.1 – 0.3

where the glutamate itself was noticeable. We noted that the blander the food, the narrower was the range where glutamate could be employed as a seasoning. A good example of this was found in sweet potatoes.

Monosodium glutamate has been found to have certain specific effects. The natural flavor characteristics of carrots and cauliflower, for instance, were intensified. It reduced the sharpness of highly acidic foods. It diminished the inherent bitterness of fresh spinach. It obviated the sharpness of onions and suppressed the bite of radishes, and aided materially in the reduction of peel taste and earthiness in white potatoes and certain other root vegetables. It lessened the fishy note that is sometimes present in lima beans. Glutamate added to shelf-aged canned tomato puree at 0.2 percent, notably cut the metallic taste. When added at the same level to canned tomato juice, shelf-aged and artificially aged at 45° C. for two months, monosodium glutamate was found definitely effective in reduction of the "tin-can" flavor. It was able to augment the intensity of flavor and aroma that had been overshadowed by the addition of butter to hot, fully seasoned vegetables such as green beans.

Recent work in another laboratory *(2)* has shown that a number of cooked vegetables, such as peas, green beans, mushrooms and asparagus contain from 0.03 to 0.2 percent of glutamate. (This is a private communication from Dr. Lucile Hac.) Perhaps it is the naturally occurring glutamate in such vegetables that contributes

to the "mouthfullness" and satisfaction of stews made from them. Additional glutamate still further enhances this action.

A new observation made in this study was that considerably larger amounts of glutamate than were required for minimum effect often produced unusually interesting results. While these tastes were quite desirable, the economics of the situation might limit the extent to which they can be used.

In practically every instance, we found monosodium glutamate compatible with vegetables, the minimum effective range being, for the most part, under 0.5 percent. In these low proportions, glutamate possessed the ability to merge the individual components of aroma and taste, without diminishing the intensity, of nearly every cooked vegetable studied and without itself being noticeable. It was found that glutamate intensified sweetnes or saltiness in a food when these characteristics were near their optimal value. It helped correct rawness of flavor. It gave relish to overcooked vegetables by imparting taste body and "mouthfullness" or satisfaction.

LITERATURE CITED

1. Cairncross, S. E. The effect of monosodium glutamate on food flavor. Presented at the Symposium of the Quartermaster Food Institute, Chicago, March, 1948.
2. Hac, Lucile R. Research Laboratories, International Minerals and Chemical Corporation. Personal communication, work to be published.

THE CONSUMER FOOD ACCEPTANCE SURVEY [a]

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The quantitative analysis of consumer preferences and of consumer markets is rapidly achieving an importance to the food producer and manufacturer commensurate with the quality control of food itself. To avoid bias from the many subjective elements which enter into the execution and evaluation of consumer surveys, careful design and planning are necessary. In this timely discussion of procedures and precautions, the author deals with methods of sampling the population, personal interviewing, questionnaires, etc., and presents a useful bibliography for those interested in pursuing the subject further.

A consumer food acceptance survey is made in an attempt to measure the acceptance of a single food or several foods by a group of people who are the potential consumers.

MEANING OF ACCEPTANCE

Acceptance may mean "approved" or merely "not rejected" in contrast with disapproval or rejection. For certain purposes this measure of the floor of acceptance is sufficient. In reality, however, it must be recognized that acceptance is a relative concept, and that acceptance of a food must be evaluated in terms of the alternatives of choice present and the conditions prevailing upon the individuals at the time of the test.

In these times of rapidly changing prices and varying availability of consumer's goods, the applicability of the results of a consumer acceptance survey for later time periods needs careful interpretation. With this preliminary statement regarding "acceptance" and a word of caution regarding the applicability of the results of acceptance surveys, let us proceed to review the processes by which an acceptance survey is developed and some of the problems involved.

THE CONSTRUCTION AND DEVELOPMENT OF A SURVEY

The development of a consumer food acceptance survey involves, prior to the summarization and publication of results, at least four major steps. Some of these are obvious but they are so essential to the success of a survey that they are worthy of review:

1. A complete description of the group of consumers whose opinion is desired; that is, to define the group of consumers to be studied.
2. A full recognition of the purpose and intent of the survey; of what use will the results of the survey be?
3. The construction of an efficient sample design; that is, one which will give the most information for the money and time available, one which will give within acceptable error limits the information wanted most economically.
4. The construction of questions and other techniques for obtaining the information from the individuals of the sample group selected. The questions must be so constructed and the technique of their use must be such that the results are valid.

The first two steps, definition of the consumer group and statement of purpose of the survey need little explanation. I shall make a few observations and proceed to sample design and the questionnaire.

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[a] Presented before the Eighth Annual I. F. T. Convention, Philadelphia, Pa., June 8, 1948.

Although we speak of consumer acceptance survey, we should keep in mind that in most cases such surveys are made to secure the opinion of a rather select group of consumers. The Quartermaster Corps, for example, may be primarily interested in the attitude of men of draft age. The relief administrator's primary interest is the attitude of clients of social agencies. The public health nutritionist is interested in the acceptance of certain foods by persons who show clinical deficiencies of diet. The public administrator of occupied territories and responsible public officials administering food distribution may and should be concerned with the relative acceptability of foods for evidence of what foods people will turn to if the normal supply of customary foods is restricted. Marketmen are concerned with the acceptance by consumer groups in direct ratio to their effective demand for the food; the quantity of the food they can sell to the consumers who have the dollars to spend for the food. Persons charged with the construction of suggested, tentative, or mandatory standards and labeling of consumer goods should be cognizant of the relative acceptance of the many quality factors so that these qualities may receive proper emphasis in the grading and/or description of the food.

These investigations place emphasis on what may be called the static acceptance pattern, and are intended simply to reveal the state of acceptance with no reference as to the "why" or "how" of these acceptances. There is a second type of investigation, which I shall refer to as the dynamic study. In such an investigation, effort is made to determine what factors have shaped or might change the acceptance pattern. Admen and marketmen, for example, want to know how susceptible consumers will be to new products, and how effective sensory appeals (taste, color, etc.) and the appeal of better nutrition would be in influencing acceptance. Persons in public health education, interested in changing the dietary pattern of persons with deficient dietaries, would like to know what foods of greater nutritional value can be introduced into the food patterns with a minimum of effort and maximum improvement. During periods of rapid changes when customary foods may be unavailable, such as during wars and crises, there arises the public issue of what foods can be substituted with minimum promotional expense (and preserve nutritional standards). The reader is undoubtedly well aware of many other areas of application of the dynamic studies. The committee on Food Habits of the National Research Council has extensively reviewed studies of the dynamic type.

In summary, then, surveyors of consumer food acceptance are not usually concerned with the acceptance of all consumers, but of a particular group of consumers, and then only within an area defined by the purpose of the investigation. The description of the group to be investigated and a clear statement of purpose is fundamental to the structure of an efficient sample design.

SAMPLING

Once the investigator has defined the consumer group and stated the purpose of the survey, the statistician can proceed to design the sample. We asume that the reader is sufficiently aware of the value of sampling as against complete enumeration that we need not expound on the desirability of sampling.

What type of sampling procedure is recommended? First, let me raise an ugly question: Does the investigator want a true picture of consumer acceptance, or does he simply want a result to uphold his convictions? I am reminded of a story told me by an inventor friend. He had perfected a mechanical counter for use at fairs and exhibits and approached one of the exhibitors at the World's Fair to test it. It was agreed to install the counter in an area where the exhibitor had been employing professional counters. Within a short time the exhibitor clamored to discontinue

the gadget. The recorded count of visitors to the exhibit was too low. The mechanical counter, unable to read the signs of happiness and content on the exhibitor's face as it reported the number of visitors, had to tell the truth. The management didn't want the dismal truth and the inventor lost a market for his gadget.

By way of contrast, let me quote from the published results of three surveys: "Women—almost 2,000 of them! . . . The inquiry was undertaken to discover what women opinion leaders think about labeling. It makes no pretense at being a 'cross-section survey', but participants live in every part of the United States—in cities, towns and on the farms. Because a true picture of leadership opinion was desired, . . . " *(1)*. Now, I ask you, do you think a true picture was desired from a survey which made no pretense at being a cross-section survey, whatever may be meant by cross-section survey? Perhaps Dr. Watson's facetious remark is in order: . . . "national cross-section means that at least some interviews were taken west of the Mississippi River. If, in addition, the interviews were apportioned by color, age, sex, and income as reported in the 1940 census, it removes the last shadow of doubt that we can take the results of the survey and recommend action to our Board of Directors, or does it?" *(14)*.

Now, let me quote from a better type of survey. "For many important items, national estimates based on 3,000 interviews are quite reliable, however. The sampling error of percentages in percentage distributions is such that the probabilities are only one in twenty that the survey findings differ from the true percentages by more than two percentage points" *(2)*. And from another survey which used a similar sampling procedure, and which sampled 1,782 women of the estimated 45 million women between the ages of 18 and 65 years, "For the sample as a whole, percentages ranging between 20 percent and 80 percent are accurate to within 4 percentage points. That is, the chances are 67 in 100 that the true percentage falls somewhere within four points on either side of any given percentage. The chances are 95 in 100 that the true percentage will fall within eight points on either side of any given percentage" *(3)*.

What is the secret of the success whereby one survey can report truthfully only the results of the 2,000 persons interviewed and can make no statement regarding those consumers who were not interviewed while the other two surveys can state with confidence after interviewing 1,782 women or 3,000 consumer units that had all women between the ages of 18 and 65 or all consumer units been surveyed, the probability is one in twenty or 95-100 that the resulting true percentage would not exceed two percentage points or eight percentage points from the published findings? The secret lies in having drawn the sample in such a way that each unit of the population sampled had an equal or known chance of being included in the sample. Only if each unit had an equal or known chance of being selected, can the results secured be construed within calculable error limits to represent the total population.

Chance selection of the sample from the population suggests random selection of the sampling units. But strict random selection has definite practical obstacles. It may be impossible to identify each unit of the population prior to the making of the survey. This renders it impossible to select a random sample therefrom. A greater obstacle lies in the cost of travel between the many sample units; a population spread over a large area would necessitate prohibitive expenditures of time and money per interview. The early work of Jessen *(10)* showed that for many items more information could be secured per dollar expenditure by including in the sample all the units in a bounded area and to select at random a designated number of bounded areas. While the clustering of interviews in randomly selected areas increases the sampling error, the reduction in costs, principally of travel, is sufficient

to render this type of sampling procedure more efficient for the measurement of many items. This method of considering a designated area as the primary sampling unit has become known as the area sampling method.

The area chosen for selection may be a county, a township, a city block or any bounded area. The rate at which the sampling units are chosen, say one in twenty, indicates the multiplier, twenty, by which the sample totals need to be expanded to yield an unbiased estimate of the population. All the individuals in the unit area may be interviewed, or, as per specific instruction, they may be prelisted and a subsample selected for interviewing. The persons interviewed are predetermined for the interviewer and are not left to his discretion. Either he calls on every unit in the area or on a randomly selected number of units in the area.

The initial cost of drawing up such a sample would be large and, in recognition of this, work was commenced in 1943 cooperatively between the Bureau of Agricultural Economics, the Bureau of Census, and the Statistical Laboratory at Iowa State College to draw a master sample of agriculture. Later the sample was extended to include cities and villages so as to make available a master sample of the entire population *(11)*.

Modifications may be made in the area sampling method so as to insure proper representation of a population characteristic which is directly related to the item being studied. For instance, if acceptance of the food in question is affected by regional differences, the counties, if that is the primary samply unit, will be listed by regions and the selection of counties will be made therefrom. In this way, a proper proportion of counties from each region is assured. Further stratification may be justified, e.g. according to urbanization, racial stock, economic status, etc. Such stratification is of value, however, only if the items under investigation are related to the strata characteristics. In many food acceptance studies this supplementary information is not known. Only after continued research and additional information secured can the sampling method be improved by stratification.

The two surveys cited illustrate adoption of the area sampling method for consumer studies. One is a report of Women's Preferences among Selected Textile Products *(3)*; the other, a Survey of Consumer Finances *(2)*. In the Survey of Consumer Finances, it was equally important to find out what the "dollars will do" as well as what the heads of households are planning to do. This meant that a sampling procedure had to be adopted which would include an adequate representation of the wealthy who are few in number and for whom there is considerable variation of the items of information wanted. The procedure was to sample the upper income groups at a higher rate in the subsample, and later to weight downward the results so that they made up only their proper proportion in the final results *(6)*. Similar modifications will need to be made for food acceptance surveys in which the investigator is interested not only in the numbers of consumers expressing acceptance, but in the number of consumer dollars which will be effective in the market.

There are other types of sampling procedures which are commonly employed. The mail questionnaire is widely used and is attractive because of its lower initial cost and cost per inquiry. The mailed inquiry suffers as a reliable estimate because of inadequate control of the sample. Those who answer the inquiry may not be representative of those who failed to answer. This may be remedied by supplementing the questionnaire with a personal interview of a sample of the respondents who failed to answer the inquiry, thereby securing a measure of the bias resulting from incomplete returns. The mailed inquiry has other failings which I shall not list, but which are widely discussed in the literature. On the other hand, the mailed

inquiry may prove an economical method of securing a rough indication of the variety of responses and the diversity of opinion, which information may be useful in developing a more refined sampling method.

The quota method is also widely used. In this method, the population is divided into a number of strata or cells and a sample is drawn proportionately from each cell. The number of people in each cell is called the quota for the cell. Often the selection of the people is dangerously left to the discretion of the interviewer. Interviewers cannot be trusted with this vital decision or bias will result. Secondly, the cells or strata may not bear directly on the item of information wanted, and adequate data may not be available for formulating the quotas accurately. Such errors will manifest themselves when the sample is expanded to represent the total population.

THE INTERVIEW

Once the sample has been determined there remains the problem of how best to elicit the wanted information from the consumers. Part of this problem lies in the manner in which the interviewers are selected and trained. And part of the problem lies in the type of questions used, the wording and phrasing of individual questions, the sequence of questions, and the aids employed to help the respondent in grasping the intended sense of the question. I shall not deal with the problem of training and selection of interviewers, but shall concentrate on methods of questioning.

There are several methods of conducting food acceptance surveys. If the purpose of the survey is simply to discover what foods are accepted, this may be revealed by observation of consumers in stores, inventory of products which the consumers have on pantry shelves, and a direct questioning of consumers regarding their recent purchases or recent foods eaten *(4)*. If the purpose of the survey is to unfold reasons why consumers have a certain pattern of preferences and what factors have influenced consumer food acceptance, a more difficult problem besets the investigator. The consumer may not know the answers to such questions, never having examined critically the basis of his own behavior, and the consumer, if pressed, will likely turn to answers which he considers socially desirable. The problem is at best a difficult one, and much of its success turns on the design and construction of the question.

Some investigators have employed an extremely informal or conversational interviewing technique with some success. Under this method a highly skilled interviewer, equipped with full knowledge of the objectives of the survey enters into free conversation with the respondent, and in whatever method seems appropriate in the individual case attempts to draw out from the respondent the information desired. Usually, the respondent's remarks are transcribed and insofar as possible are recorded verbatim *(9)*. While this procedure has considerable merit in that it gives the researcher a "feeling" for the multiplicity of desires involved and attitudes of which he might not have been aware, it is difficult to reduce the results of such a survey into a form convincing to a third party. The reader of such results receives no assurance as to what questions were used, how they were posed, or how many answers and comments were intentionally or unintentionally eliminated by the interviewer. What are the chances that another interviewer would have secured the same results?

Other researchers have employed a method which requires the interviewer to follow closely the exact wording of the questions. The questions may be of a strictly yes-no-undecided type, may permit multiple choice, and may consist of a battery of questions which probe into the various aspects of the issue under investigation sufficiently to satisfy the investigator that from the replies he can formulate an adequate picture of the respondent's acceptance pattern. The results of such a

survey are somewhat more acceptable to the reader. While he still may question whether the same replies would have been secured had the questions been worded differently, or whether the questions asked did not restrict the freedom of the respondent to freely express himself, he at least has the benefit of knowing that questions were asked and what replies were secured.

A third type of investigation, and one which has become widely employed is the open-end question. This technique has been identified with the name of Rensis Likert, formerly of the Division of Program Surveys, and more recently Director of the Survey Research Center located at the University of Michigan.

The open-end question is designed to permit the respondent to give full expression on the issues under investigation. After a few general questions or introductory questions, specific follow-through questions are asked to probe fully into the underlying issue. The questions are termed open-end because responses are not restricted to a checklist or suggested answers. Campbell *(5)* gives three basic advantages of the open-end question: (1) It facilitates establishing rapport with the respondent. (2) It brings forth a full answer. The interviewer knows how well the respondent understood the question and the issue involved, the reservations with which the preferences are qualified, and some idea of the intensity of the preferences. (3) It permits the respondent to contribute information which the investigator may not have anticipated when making out the questions. It should be obvious that this method requires skilled interviewers and careful coding and editing of replies.

A new and useful measure has been developed, combining the open-end question with the fixed alternative question. While the questions with fixed alternatitves risk undue restriction of the respondent's possible answers, the open-end question runs the danger that the respondent's impromptu remarks may be misleadingly incomplete. This may be remedied if the respondent is first allowed to give free expression in answering the open-end question, and then to answer the question according to a checklist of alternative answers. The replies to the open-end question may be termed the spontaneous or salient response, and the replies to the check-list, the prompted replies. For those who may wish to differentiate between the two types of answers in interpreting the findings, there should be included in the published findings the "ratio of salience," the ratio of salient responses among total responses *(3)*.

The success of these methods rests on the training and skill of the interviewer and on the questions used. The test of a successful question is that it yield both reliable and valid results. A reliable question is one which if repeated under the same conditions would elicit the same response. And a valid question is one which actually taps the issues under investigation. Ambiguous and emotionally charged wording should be avoided. Care must be exercised in the listing of the questions so that they appear logical to the respondent, and so that the sequence of thought provoked by the earlier questions does not unduly influence the answers to subsequent questions. The questions must be tailored to fit the personalities of the persons interviewed, and utmost care must be taken that the questions are understood and properly interpreted.

While there are many guides available for the drafting of questions, there is no set list of conclusive principles. Furthermore, as one student of the field has pessimistically stated regarding the future of finding a solution to the problem of question-wording, "It takes no stretch of the imagination to see that by taking all the ways in which a question may be stated and all the possible variations in the response set-up, it is possible by permutations and combinations to outline an enormous number of so-called research projects with the aim of studying the effects of purely

mechanical aspects of asking questions and securing responses. . . . It would seem that the quest for an unbiased question-answer set-up would be interminable" *(12)*.

There has been developed another technique which avoids such complete reliance on the wording of questions and which the proponents claim is adaptable to the fields of consumer and market research. It is known as "Attitude Scale Analysis" and was first propounded by Guttman of Cornell in 1944, and developed extensively during the war *(7, 8)*. A complete statement of the work is forthcoming in several volumes being prepared under the auspices of the Social Science Research Council.

To brief their technique, the thesis is that an infinite number of questions or wordings can be constructed to get at the respondent's opinion. Any one set of questions, therefore, is but a sample of all questions that might have been used. Two such sets of questions may give highly divergent results and lead to misleading conclusions regarding the proportion of respondents who hold favorable or unfavorable opinions with respect to the issues under investigation. However, if the "attitude scale analysis" technique is employed, it is possible to establish the true and invariant division point as between persons holding a favorable or unfavorable attitude. The division will be substantially the same regardless of which set of questions is employed. A solution to the problem of question bias may be at hand in this technique *(13)*. It shows promise of contributing greatly to the field of food acceptance research.

I should like to emphasize one general point. Food acceptance research requires the cooperation of many professional skills. No one skill is sufficient to accomplish the task. The statistician is needed to design the sample, the food technologist must be consulted regarding the various characteristics of the food, the services of the human nutritionist and physiologists may be needed, as is the psychologist for the development of the question-response procedure and selection and training of interviewers, the social psychologist and cultural anthropologist for proper interpretation of the cultural forces which have their impact upon food acceptance, the economist and marketmen for estimation of the economic significance of the results. This list is not complete, but inclusive enough to express the necessity for cooperation in this area of research.

Also, I should like to add that those of you interested in pursuing this further will find an extensive review of this subject in an article entitled "Rationale for Consumer Food Acceptance Studies" which I have prepared for publication in Volume II of "Advances in Food Research."

LITERATURE CITED

1. Anon. *Labels in the spotlight.* The Grocery Manufacturers of America, Inc., 205 East 42nd St., N. Y. 17, N. Y. (1946).
2. Anon. Survey of consumer finances. Appendix, explanation of the sampling method. *Federal Reserve Bul.* **33**, No. 6, 658 (1947).
3. Anon. Women's preferences among selected textile products. *USDA, Misc. Pub.* **641**, pp. 4, 5-6, 111 (1947).
4. Blankenship, A. B. Ed. *How to Conduct Consumer and Opinion Research.* 1946, Harper and Brothers, New York.
5. Campbell, Angus. Interviewing for food habits surveys. War Department, Office of Quartermaster General, *QMC Manual* 17-9, 52 (1946).
6. Goodman, Roe. Sampling for the 1947 survey of consumer finances. *J. Am. Stat. Assn.*, **42**, 439.
7. Guttman, Lois. Basis for scaling qualitative data. *Am. Soc. Rev.*, **9**, 139 (1944).
8. Guttman, Lois. The Cornell technique for scale and intensity analysis. In Churchman, C. W. et al. Eds. *Measurement of Consumer Interest.* 1947, Univ. of Penn. Press. Philadelphia.

9. HEIDINGSFIELD, M. S., AND BLANKENSHIP, A. B. *Market and Marketing Analysis.* Henry Holt and Co., N. Y. (1947).

10. JESSEN, R. J. Statistical investigation of a sample survey for obtaining farm facts. Ia. Agr. Exp. Sta. *Res. Bul.* **304** (1942).

11. KING, A. J., AND JESSEN, R. J. The master sample of agriculture. *J. Am. Stat. Assn.*, **40**, 38 (1945).

12. MCNEMAR, QUINN. Opinion-attitude methodology. *Psych. Bul.* **43**, 4, 289 (1946).

13. SUCHMAN, E. A., AND GUTTMAN, LOIS. A solution to the problem of question "Bias." *Publ. Opin. Quart.*, **11**, 445 (1947).

14. WATSON, A. N. What's ahead in statistical sampling as applied to market research. In Churchman, C. W. et al. Eds. *Measurement of Consumer Interest.* 1947, Univ. of Penn. Press, Philadelphia.

COMPARATIVE EVALUATION OF SPICES [a,b]

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A specific panel-testing procedure has been developed for the organoleptic evaluation of spices, herbs, seeds and other flavoring adjuncts. Required for this purpose are bland, bodied, semi-solid and liquid test foods simulating representative types of foods. Formulas for seven such have been developed. Their usefulness in evaluating flavors provides newer bases for panel-testing a wide range of adjuncts.

Although chemical, physical, bacteriological and physiological methods all have their place in the examination and comparative evaluation of food materials and food products, it is usually essential to resort to organoleptic methods for final comparative evaluation. Although chemical and physical methods are generally more objective, and more precisely quantitative within ranges indicated by their limits of accuracy, they very frequently lack the sensitivity required to detect the minute differences in composition that may result in marked differences in odor and taste. Careful attention to the technics employed in organoleptic testing, use of testing panels consisting of several trained observers, and statistical treatment of the results can be made to yield quite objective, quantitative and reproducible comparisons of odor, taste and color qualities of food materials. The importance of organoleptic methods, used with due regard to proper technics, is attested to by various reports in the literature.

Specialized studies have been made of some specific materials, such as milk products, by Trout and Sharp *(5)*. Many review-type reports on general panel-testing technics have been published. Among these are the report by Sweetman *(4)* on palatability and by King *(3)* on the planning of a panel. The reliability of results obtained from organoleptic testing has been reviewed by Crist and Seaton *(2)*. A previous paper by the authors *(1)* reviews the technic of organoleptic testing and deals with the psychology of flavor.

In no part of the literature does there appear any reference to the direct evaluation of spices, seeds or herbs in their natural ground form. Our laboratory has been engaged in the organoleptic evaluation of spice materials under a research project established by the American Spice Trade Association. Under this program, we have carefully evaluated 13 spices and spice classifications in their ground form. Of prime importance has been the ability of individual members of the evaluating panel to duplicate their results. Adjustment of the methods used in evaluation was made after the preliminary scoring had been analyzed. Not only were changes made in the technic of tasting, as well as the checking of odor and color, but the weight of the score given each factor was discussed and cooperatively adjusted. This discussion period was found to be of great value in establishing clarity of purpose and agreement on the introspective opinion to be expressed on the factor under consideration.

In the case of spice materials, it is necessary for all panel members to agree on their basis for judgment of color and on the color range usually seen in a certain ground spice. The flavor, especially because of its great intensity in spices, must

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[b] Presented before the Eighth Annual I. F. T. Convention, Philadelphia, Pa., June 8, 1948.

be discussed thoroughly. It is helpful to have the panel know the uses made of the spice in food manufacture and in the home. It is well to discuss its botanical nature, as this helps explain certain taste factors, such as the lingering after-taste or immediate pungency when the spice is put in contact with the tasting mechanisms in the mouth. The variety or type of spice under test, such classifications as cloves from Zanzibar, Madagascar or Pemba, nutmegs from the British West Indies or the Netherlands East Indies, and cassia from China, Ceylon or the Straits Settlements, should be made common knowledge to the panel, since certain well-known differences in flavor intensity and character exist in various varieties. With the panel fully informed on all factors, scoring can proceed and the results obtained should be reproducible.

With a specific scoring technic in use and an explanation of the organoleptic factors to be ascertained given, the reader of a report on the evaluation of a flavor factor, in this case spices and spice flavors, can interpret the results and obtain a picture of comparisons of types of spices and a comparison of one spice, evaluated by the same technic, with another spice. This will indicate the degree of flavoring intensity imparted to a food by the type of spice evaluated. The quality of flavor can also be ascertained by an interpretation of the findings in the light of a quality rating determined from the panel's scoring of the spice. Panel testing gives results that can be very valuable in developing the flavor of new foods.

The Flavor of Spices: The flavor of most foods or flavor adjuncts is largely due to taste and odor. However, certain other factors play an important part in the total flavor of a spice. These include the interesting factors of pungency, heat, sweetness, cooling, and a mild taste-bud anaesthesia.

The pungency has a great deal to do with the pleasant stimulatory sensation felt when carefully-spiced foods are eaten. It has been said that a great deal of the pleasure of eating can be due to the subtle flavor imparted indistinguishably by certain piquant, pungent spices. Our usually bland diet can be "pepped up" noticeably by the judicious use of certain pungent spices in food formulation and processing. Some of the pungent spices are ginger, cloves, mustard and cassia.

A heat sensation is felt in the mouth, the throat and throughout the system after the ingestion of certain hot capsicums or of appreciable quantities of black or white pepper. This can be a pleasant stimulation and may be related to increased speed of digestion and peristalsis, which causes the body to feel warmer. The oleoresin itself seems to cause local stimulation in the mouth and throat. A stimulation of this kind aids the digestive processes which start in the mouth and continue in the stomach. Studies are now being planned to investigate the relationship between this action and the complete digestive process.

Certain spices, such as cassia, nutmeg and mace, have a sweetness due to non-sugar taste-bud stimulation. We believe that they can be used as adjuncts to a low-sugar diet, providing pleasant taste where normally blandness prevails. This desirable factor of sweetness is not found in all extractives.

The sensation of cooling may easily be coupled with the mild anaesthetic effect produced by such spices as cloves and ginger. The presence of eugenol and other nerve-sedative oils and oleoresins accounts for this sensation. This produces a subtle physio-chemical effect on the sensory nerve endings. It is a component that adds considerable novelty to a food so spiced.

We believe that the flavor of paprika, which has frequently remained undetected, is related to the high vitamin C content of this spice *(1)*. This vitamin not only helps to stabilize the flavor of the food to which the paprika has been added, but also contributes a flavor of its own.

Organoleptic Testing of Spices: Samples of fresh ground spices under investigation were held in hermetically sealed screw-top glass jars. A supply of household-stored old spices was obtained. These were helpful comparative materials for use as standards of minimal quality.

In evaluating the spices for odor strength and quality, samples are smelled directly in the small sample jars by opening the jar and checking the odor immediately. Re-checking by re-opening the jar does not provide serious variation in odor discrimination.

A portion of the sample is placed on white cards for the other evaluation determinations. Small, folded cards, ½ inch by 3 inches, serve as spoons. In our work, the spices are tasted by a direct application of varying amounts of the dry, ground spice to the tongue. The amount varies from moderately large amounts, about 0.1 gram of spices such as cloves and cinnamon, to very small amounts, one or two particles, of hot capsicums (cayenne). Portions of the spice are tasted by the panel member, each using his own judgment of the quantity to be placed in the mouth. After each taste, the mouth is rinsed with tap water at normal drinking temperature.

Color is determined by flattening the small portion of the spice on the card to a depth of about ⅛ of an inch. This provides a level surface for light reflection.

Our scoring form is shown in Figure 1. Space is provided for the comparative evaluation of a number of spice samples on the same scoring sheet.

SCORING FORM

Spice Research and Development Institute Research Project
Foster D. Snell, Inc.

Spice: Date:
Basic Test Food: Panel Member:
Temperature, Room:
Food:

Spice Designation	Maximum Score	
Flavor:		
Odor Strength	25	
Odor Quality	25	
Taste Strength	20	
Taste Quality	20	
Aftertaste Quality	5	
Aftertaste Duration	5	
Total	100	
Color:		
Strength	40	
Trueness	40	
Brilliance	20	
Total	100	
Total Combined Score	200	

Comments:

FIG. 1. Form for the Evaluation of Spices and Spice Flavored Materials.

In order to have available a standard upon which to base the comparative scoring of spices, all the samples of one spice were exposed to an "opinion" scoring, with the sample selected as best on all factors being assigned a score of 90% of the maximum. Using this "best" spice as a standard, with the 90% rating, allows us to give subsequent samples higher scores on any of the factors, should they be deemed superior to the standard sample.

Our work on old spices corroborated our early idea of using them as a minimum standard, giving them a score of 50% of the maximum on each factor. Most of the spices held in opened containers over one year scored slightly above 100 out of a possible "total combined score" of 200. They were very useful minimal standards. Use of a poor spice for comparison helps in establishing scores of other, superior spices.

The scores obtained by the evaluation of an individual spice in comparison with the "best" used as a standard are given in Table 1. The first figure for each spice shows its score when paired with the standard. The second figure for each spice shows the score obtained when the spice was scored in comparison with the standard and with the household-stored old spice, all three evaluated at the same time. Scores for the old spices are not given in this table. When three spices are evaluated at one time, there is usually an increased deviation in the scores assigned by the panel over those obtained when only two spices are evaluated. Each spice presents a different problem. The majority of the spices scored slightly higher when compared in pairs (the first figure); these were: hot capsicums, cloves, coriander, mustard, black pepper and sage. The two scoring lower (mace and cassia) were the milder spices, which are slightly more difficult to judge on the basis of discriminatory differences. However, an examination of the scores shows only negligible differences for these two spices, indicating reproducibility even under different conditions of comparison.

It was decided that the best results were obtained by the simple paired comparison. Other samples of spices were scored in this manner. The results of this scoring and an analysis of the scores will be presented in later reports.

TABLE 1

Averaged Scores of Spices Evaluated in Comparison with Standard Spices Assigned a Score of 180.

Spice	Scores	Average Deviation of Panel
Capsicums, hot	142.0	±7.2
	141.0	±11.1
Cassia	160.2	±8.5
	161.4	±6.2
Clove	157.0	±7.9
	155.0	±11.9
Coriander	153.1	±8.5
	146.9	±3.8
Mace	156.2	±7.5
	156.8	±8.1
Mustard	161.0	±5.6
	159.2	±13.3
Pepper, black	161.6	±6.3
	158.5	±13.4
Sage	142.8	±7.9
	129.8	±2.7

The degree of deviation, as mentioned above, gives an indication of the difficulty that is experienced in evaluating certain spices. Hot capsicums, cloves, mustard and black pepper cause a partial physiological blocking of some of the taste sensations. Such sensations should be received clearly to evaluate the spice. This partial blocking is due to the carry-over of the heat-producing mouth reaction in the case of hot capsicums, mustard and black pepper and to the anesthetic effect from cloves. These effects are amplified if more than two samples are being evaluated. Rinsing the mouth with water between tests reduces these effects considerably. The trained panel may subjugate this covering sensation somewhat, and be able to determine the other factors in a discriminatory manner in the presence of the covering sensation. However, there exists this added strain which influences scores appreciably. In the light of this situation, the results must be analyzed and interpreted objectively with these factors in mind.

Test Foods and Mixtures: In order to evaluate spices, herbs and seeds, as well as flavoring adjuncts in general, it has been found that a group of simple test foods and mixtures is useful. We have developed a group of bland, bodied liquid test foods. They are materials that allow the proper incorporation, by complete mixing, of flavor materials under investigation. These types of test materials lend themselves to simplified panel testitng. They can be held at the desired temperature satisfactorily because of the slow heat loss from liquids and semi-liquid materials.

Other types of test mixtures have been prepared in addition to the liquid types. An attempt has been made to develop test materials simulating every type of food item normally containing added flavor materials.

One of the liquid materials mentioned above is a simple white sauce. The formula is: wheat flour 7.0%, salt 0.5%, sugar 0.4%, and water 92.1%. These are blended and cooked. Much experimentation was needed to establish these levels of salt and sugar, which render the sauce palatable, but do not interfere with evaluation of added flavor adjuncts. The product is stable, imparts no color to the test mixture and can be agitated for complete mixing. It has sufficient body at near the boiling point to aid in the dispersion and suspension of solid spice particles, yet it will still flow at room temperature. It can stand prolonged boiling, if needed, for stability tests. This mixture has provided us with a very useful medium for the testing of flavor adjuncts in an aqueous medium.

To test flavor adjuncts in an oily medium, an oil white sauce has been devised. The formula is: wheat flour 6.44%, salt 0.46%, sugar 0.37%, water 84.73%, vegetable oil 6.00%, and an emulsifying agent, such as commercial, food-grade glyceryl monostearate 2.00%. An excellent oil-in-water emulsion results from the careful blending and cooking of these ingredients. It is stable throughout extensive boiling. Excellent dispersion and suspension of flavors is a property of this test material.

Representative types of food materials are simulated by certain other test foods developed. These include cream sauce, sugar sirup, eggnog, pumpkin, a cabbage relish and chopped beef and pork, both raw and cooked.

The cream sauce consists of the following formula: butter 17%, flour 13%, salt 1.1%, sugar 0.4%, water 68.5%. It is planned to evaluate various spices and spice substitutes, such as capsicums, both hot and mild; caraway, coriander, ginger, mustard, paprika, pepper, both black and white; and sage, in this type of food. Although a cream sauce may seem an unusual medium for some of these spices, it can be pointed out that it is not very different in flavor from that of baked goods, in which such flavors as caraway and coriander are used. The flavor of sage can be evaluated in this food, as it approximates dressings in its body of flavor.

The use of eggnog provides for excellent comparisons of the sweeter spices, such as cassia, cloves, mace and nutmeg. Most of these spices are normally used in milk mixtures, with the possible exception of cloves. However, eggnog has a flavor well suited to cloves. A test food such as consomme would be unsuited for cloves, as it is too difficult to standardize. The formula for the eggnog is: homogenized milk 84.5%, whole egg 12%, sugar 3.3%, and salt 0.2%.

A pumpkin mixture has been developed as a test material. It is based on a formula similar to the filling used for pumpkin pie. Cassia, cloves, mace and nutmeg can be tested in such a material of a semi-solid nature in order to re-check opinions of flavor and other organoleptic criteria expressed by the eggnog test. The formula is: canned pumpkin 80%, homogenized milk 16%, sugar 3.5%, salt 0.5%.

The sugar sirup provides another simple medium for determining the flavor and color score of a group of spices such as those that can readily be evaluated in the eggnog mixture. The sugar sirup provides a background allowing for a certain type of flavor extraction such as that provided by a poly-alcohol. The formula is sugar 20%, salt 0.3%, and water 79.7%

A cabbage relish, a food similar to pickles and other acid-preserved foods, was developed. Any spice used in pickling can be studied in this mixture. Its formula is: raw, white cabbage, finely chopped 90%, salt 1.0%, sugar 3.0%, acetic acid, glacial 1.0%, and water 5.0%.

Chopped meat products are useful media for direct incorporation of spice materials and other flavors in order to study the bacterial changes and stability of flavor during freezing, and in the cooking, of the raw ground meats.

Ground, cooked, chopped ham is useful for the study of flavor stability of a meat product with added spice flavor which has to be stored over a specified period of time.

The development of test foods to be used for the evaluation of flavors, both strong and subtle, requires that the test food be evaluated and rated as excellent by itself. It should not contribute a flavor of its own other than the normal basic flavor it is expected to contribute. It must be balanced with added salt and sugar in many cases. The level of salt and sugar must be low, unless saltiness and sweetness are normally found in the food. The texture of the food must be pleasing at the temperature of testing. The product must be mixed carefully and heated to insure smoothness without lumps or graininess.

SUMMARY

The specialized panel-testing technic required for the study of flavor adjuncts is not found in the literature. The panel method for evaluating spices and other flavor adjuncts is based on careful planning, special handling of the sample and a discussion before the actual taste, odor, and color evaluation.

A scoring system for flavor and color of ground spices is based on the use of a selected high-quality ground spice as a standard, to which is assigned a score of 90% of the maximum rating for each factor. Spices are best scored in pairs.

Test foods have been developed and their formulas adjusted to include suitable amounts of salt and sugar. Their usefulness in evaluating flavors provides newer materials for panel-testing a wide range of adjuncts.

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LITERATURE CITED

1. Cartwright, L. C., and Nanz, R. A. Organoleptic evaluation of foods. Presented at the American Chemical Society meeting, Chicago, Ill., April 19, 1948. In press.
2. Crist, J. W., and Seaton, H. L. Reliability of organoleptic tests. *Food Research*, **6**, 529 (1941).
3. King, F. B. Obtaining a panel for judging flavor in foods. *Food Research*, **2**, 207 (1937).
4. Sweetman, M. D. The scientific study of the palatability of foods. *J. Home Econ.*, **23**, 161 (1931).
5. Trout, C. M., and Sharp, P. F. The reliability of flavor judgments, with special reference to the oxidized flavor of milk. *Cornell Univ. New York Agr. Expt. Sta. Mem.*, **204** (1937).

NICHOLAS APPERT MEDAL PRESENTATION

E. S. STATELER
Chairman, Chicago Section
Associate Editor, Food Industries
June 8, 1948

MR. PRESIDENT, FELLOW MEMBERS AND GUESTS OF THE INSTITUTE OF FOOD TECHNOLOGISTS:

Whether they are ceremonious or informal, award presentations sometimes have reminiscent associations.

This is one of those occasions.

Six years ago, almost to the evening, Vic Hallman, present Chairman-Elect of our host Section, represented the Chicago Section, as I am doing tonight, and made the first presentation of the Nicholas Appert Medal.

This Award was established by the Chicago Section in 1941 and is given each year in recognition of pre-eminence in and contributions to the field of food technology. Its recipient is elected by a jury of nine Members of the Institute chosen from the several geographical areas of the United States and from different fields of work in food technology.

Nomination of and voting for the various candidates for the Award are carried out by secret ballot according to specific rules embodied in the By-Laws of the Chicago Section. The procedure assures independent voting by the jurors and election of a Medalist eminently qualified to receive this significant honor and recognition.

Proof is evidenced by the professional stature of the previous Medalists. Named in the order of their election, they are: Dr. William Vere Cruess, Dr. Samuel Cate Prescott, Dr. Charles Albert Browne, Dr. Avrill Wayne Bitting, Dr. Clyde H. Bailey and Dr. Charles Olin Ball.

These Medalists, like Nicholas Appert in whose honor this Award is given, attained their achievements in the field of food processing; essentially in the field of food preservation.

Tonight we do honor to the 1948 Medalist, Dr. Conrad Arnold Elvehjem, who has attained international recognition and received other high honors for his discoveries in the field of nutrition. They are of significant importance to food technologists also. His work has been with vitamins and trace mineral elements; those activators or catalysts which have come to mean much to processors and to consumers of food.

Born at McFarland, Wis. May 27, 1901, our Medalist has attained an unusually high professional pinnacle for one so young and has before him many more potentially fruitful years of opportunity.

We have every reason to believe that his life and education as a child and as a youth were in accord with the normal American pattern characteristic of the State of Wisconsin.

In 1923, he was graduated from the University of Wisconsin with a Bachelor's degree in Agricultural Chemistry; followed by a Master's degree in 1924 and a Doctorate of Philosophy in 1927.

Concurrently, he served the University as an Assistant in Agricultural Chemistry from 1923 to 1925 and as in Instructor from 1925 to 1929.

He specialized in biochemical studies at Cambridge University as a National Research Council Fellow during 1929 and 1930.

He returned to the University of Wisconsin in 1930 to be Assistant Professor of Agricultural Chemistry; became Associate Professor of Agricultural Chemistry in 1932 and Professor of Biochemistry in 1946. Two years ago, he was asked to serve as Dean of the Graduate School at the University of Wisconsin. He continues to serve Wisconsin and Science in that capacity.

Research studies in nutrition carried on by our Medalist and his co-workers have been basic as well as numerous. The technics they have developed are as significant and are of as great value to food processors, to breeders and producers of poultry and meat animals and to nutritionists generally as are the basic facts they have contributed.

As early as 1924, Dr. Elvehjem began publishing the results of his work with vitamins which was carried on with such well-known research workers as Hart, Steenbock and Waddell. By 1928 attention was being focused on the potential importance of trace mineral elements in nutrition. Their first revolutionary finding was that minute traces of copper are essential to the functioning of iron in the formation of red blood cells.

Results of this study stimulated other studies on the influence of iron, copper, manganese, zinc, cobalt, selenium, boron and aluminum upon metabolism and upon nutrition.

While at Cambridge University, our Medalist began his studies on tissue respiration which he continues to date. These studies revealed the relationships that exist between thiamin and co-carboxylase, riboflavin and d-amino acid oxidase and xanthine oxidase and, finally, nicotinic acid and cozymase.

He is one of the first nutritionists to use a large variety of animals species as test animals and to study the relation of the intestinal flora to nutrition. His use of dogs resulted in the classical discovery that nicotinic acid is the specific anti-pellagra vitamin.

Work with nicotinic acid paved the way for his studies with pantothenic acid in relation to dermatitis and for his studies with other members of the B-complex.

His writings, in collaboration with many co-workers, have enriched the literature on biochemistry to the extent of two books, 152 papers dealing primarily with vitamins, 51 papers on enzymes and tissue respiration, 147 papers in the general field of nutrition and biochemistry, 96 on mineral elements, 26 on proteins and amino acids and 48 on foods and food processing.

All of these reported findings are of particular importance with respect to food enrichment. They are equally important in relation to feeding of poultry and meat animals, to production and processing of milk and to growing and processing of grains and other food crops.

In recognition of the high quality of his work and of the importance of his findings, our Medalist has previously received the following honors:

1. Mead-Johnson Co. Award given in 1939 by the American Institute of Nutrition for his work with the Vitamin B-complex.
2. Election to membership in the National Academy of Sciences in 1942.
3. Election to membership in the American Philosophical Society in 1942.
4. Honorary Doctor of Science from Ripon College in 1942.
5. Award from Associated Grocery Manufacturers of America in 1942 for outstanding contributions in the field of food chemistry.
6. Willard Gibbs Medal from Chicago Section A. C. S. in 1943 in recognition of the highest order of scientific achievement.

Recognition of the importance of his studies and findings to food technologists and to food processors has developed rapidly during the past few years. Conditions arising during World War II and from the after-effects of the War have speeded up that recognition and have stimulated peace-time application of his findings and adoption of his technics in the field of food technology.

As one tangible evidence of that recognition, Dr. Conrad Arnold Elvehjem has been elected the 1948 Nicholas Appert Medalist.

Representing the Chicago Section, I voice the pleasure and the honor that come to our Section to have the privilege of presenting this Award to you, Dr. Elvehjem. May your illustrious work continue for many years.

CONRAD A. ELVEHJEM

Chairman, Department of Biochemistry and Dean of the Graduate School,
University of Wisconsin, Madison, Wisconsin

THE ROLE OF FOOD TECHNOLOGY IN MODERN NUTRITION*

C. A. ELVEHJEM

Nicholas Appert Medal Award Address, Institute of Food Technologists
June 8, 1948

A review and discussion of some of the more recent, salient work in nutrition by the author and others are presented. Certain new factors, which have not yet been completely identified, are described. The interrelationship of the vitamins and amino acids is strongly emphasized, as is the necessity for proper processing to assure the maintenance of high nutrient content of foods. Caution is urged in carrying the use of synthetic nutrients too far in a program of nutrition.

It is with deep appreciation that I accept the Nicholas Appert Medal established by the Chicago Section of the Institute of Food Technologists. The honor of being included with the previous distinguished medalists means a great deal to me. I am also pleased to have the opportunity to meet with this enthusiastic group again. I recall very well your first meeting in Chicago when Dr. Harvey asked me to discuss "The Nature and Properties of the Known Vitamins." Fortunately, some of the new factors which I outlined at that time have become a reality. Although I have not had an opportunity to attend many of your meetings, I have followed closely your reports and proceedings.

However, this award has an even greater significance and meaning to me. Since I am primarily a biochemist and nutritionist, it is apparent that all of you recognize the importance of nutrition in the field of food technology. In the words of Mamma in the play "I Remember Mamma," "It is good," since the future of food technology is dependent upon the application of the fundamental principles of nutrition to an even greater extent than has been true during the past decade. However, a sound nutrition program for the production and maintenance of health must make use of every new development in food technology. Therefore, I should like to review very briefly the part which food technologists have played in the advances leading to our modern conception of better nutrition for all.

In the remainder of the time I should like to indicate some of the problems which will undoubtedly be encountered in future developments.

The preservation of food, to compensate for variations between time of production and time of consumption and between the place of production and the place of consumption, is an old, old problem. It was fortunate for mankind and it is still of significance in the 20th century, that cereal seeds can be harvested and dried without artificial means so that they may be stored for long periods of time and transported long distances without serious deterioration. Our world food problem today, in spite of all our modern technology, would not be very effective if we did not have wheat. Methods of storing, transporting, grinding and baking for human consumption, may be simple, or elaborate depending upon local conditions. Greater difficulty is involved in handling most of our other foods, except perhaps nectars rich in sugar. The preservation of high protein foods requires a supplementary treatment during the drying process, such as the addition of salt, sugar, smoking, etc. The intervention of fermentation, at first accidental, and later deliberate, expanded preservation to leafy vegetables, fruits and milk. One might discuss at length the origin of foods which we most enjoy today on the basis of required methods of preservation. One of the best examples is our dairy products. In localized areas with no refrigeration the only means of extending the seasonal production of milk was to make butter and cheese. Today with modern refrigeration there is no absolute need to make some

of these products and from a nutritional point of view it might be preferable not to separate the compenents of milk, but you all know the objections which would be forthcoming immediately if we deprived the American people of butter, cheese, ice cream, etc. These products are most valuable for supplying calcium, vitamin A, riboflavin and other nutrients in the diets of those who think they do not like fluid milk. These products are, therefore, most useful and the nutritionist must never forget that adequate nutrition can only be obtained through a variety of appetizing and appealing food products. A short time ago Dr. Boudreau told of his experience in presenting a request to the trustees of the Milbank Foundation for the support of a French dietitian who wished to take advanced work in this country. His Board heartily approved but one member asked if this girl might teach the American dietitians how to cook while she was learning dietetics.

Naturally our interest in various forms of food processing changes as we learn more about the individual nutrients needed for optimum nutrition. At first the emphasis was of necessity on total weight but today greater attention is given to the more labile constituents whether they be vitamins or delicate flavors. The success with which new approaches have been applied is evident by comparing, for example, the incidence of scurvy among the crews of our sailing vessels less than 100 years ago or even among members of our military forces in World War I with that observed in our military forces in the last war. Recognized deficiency diseases just did not occur. The end result was not accomplished without great effort and not without some misunderstandings between nutritionists and food technologists. Perhaps there were just sufficient misgivings to stimulate greatest progress. In the presentation of this medal tonight you are paying tribute to Nicholas Appert who is recognized as the father of our modern canning techniques. Foods prepared by this process naturally attracted attention because new foods became available during additional periods of the year and to population groups who could not obtain them previously. Being a Frenchman I am sure that he was at least as interested in the taste appeal of the preserved products as he was in nutritional quality. Apparently longtime preservation has been accomplished through improved methods of canning since Barcroft has recently described finding the contents of cans 87 to 100 years old, in satisfactory condition. The spoilage which did occur was not understood until the science of bacteriology was developed. In 1895 Prescott traced the spoilage in certain lots of canned material to imperfect sterilization.

In looking through the Annual Reports of the Agricultural Experiment Station of the University of Wisconsin, I found a report by H. L. Russell on gaseous fermentation in the canning industry in 1895 and in 1903 he reported that by raising the temperature at which peas were canned from 232° F. to 242° F. a spore bearing bacillus which was responsible for the swells was entirely destroyed. However, at least 30 years elapsed before any definite reports on the nutritive value of canned products were included in these Station reports.

When new factors were being discovered during the 1920's and 30's it was not surprising that questions were raised regarding the possible destruction of these factors during food processing especially when diets for experimental animals were rendered deficient through autoclaving, a method very similar to that used for the sterilization of food products. However, it was fortunate that the conservation of some of the nutrients was actually improved through the use of commercial methods of processing. This was especially true in the case of vitamin C and vitamin A. This gave everyone more courage to continue studies on the remaining factors. However, even so, studies on the loss of thiamine and some of the B vitamins was approached with considerable caution. I remember the early studies which Dr. Arnold and I

made on the retention of vitamin B_1 in canned foods. That was before the thiochrome method had been developed and we laboriously determined vitamin B_1 through the use of the chick assay. In order to have sufficient thiamine present in the samples which were used for assay we were forced to turn to pork muscle because it was very high in this vitamin. In spite of the complicated procedure the results were remarkably constant and we concluded at that time that it is doubtful if methods can be modified sufficiently to prevent all loss of the vitamins and still bring about complete preservation of the product.

Today with the improved techniques changes in the thiamine content can be and have been measured during practically every step in the processing of many foods. The results clearly indicate that we cannot generalize regarding the retention of any nutrient until we have the actual measures. The best example is the loss of thiamine in dehydrated food products when stored at somewhat elevated temperatures. One would expect no loss after completion of the dehydration process but apparently thiamine is more labile at a moisture content of 5-10% than at any other concentration due undoubtedly to the effect of the salts present. Therefore, we must recognize these changes and as far as I know there is no way of preventing some loss of thiamine and perhaps folic acid and some of the other more labile factors.

Great progress has been made in the perfection of simple methods for the estimation of most of the known vitamins but there are still many problems where these methods are applied to fresh and processed foods. In most cases each vitamin is present in more than one form. Vitamin B_6 activity may be due to pyridoxine, pyridoxal or pyridoxamine. Each of these compounds has the same physiological activity after entering the blood stream but they differ considerably in their stability even when taken into the digestive tract. Folic acid or pteroyl triglutamic acid may exist in several conjugated forms. These compounds may not only differ in stability but they may differ in physiological activity. The early studies on the loss of folic acid during the handling and processing of fresh foods were made before methods which measure total folic acid were available and some of the values may indicate a greater loss than actually takes place. While some of the vitamins are lost rather rapidly merely by allowing vegetables to stand at room temperature (Vitamin C and folic acid) others may be liberated and become more available during food processing. Biotin is held in rather firm combinations and its release certainly does not decrease its availability. Therefore, no one should be reluctant to obtain the actual facts on the stability of vitamins during food processing and the availability of the finished product. A little loss of some of the vitamins should not be disturbing when for example the entire supply of thiamine for one individual for one year can be supplied in synthetic form at a wholesale cost of less than 10 cents. This does not mean that I advocate the general use of synthetic vitamins and I want to emphasize that I agree completely with the statement recently made by the Council on Foods and Nutrition of the American Medical Association.

The Council wishes to encourage efforts to improve as far as possible the nutritive quality of all foods which contribute importantly to the American diet and which thereby constitute the food environment of the people. In spite of all these efforts there exists now and will undoubtedly continue to exist for some time, certain specific deficiencies in large segments of the population which can be remedied best through addition of indicated nutrients to cheap, staple foods that occupy substantial places in the dietary. The Council has favored and encouraged the addition of certain nutrients to selected foods for the purpose of overcoming these deficiencies by replacing as nearly as possible that which has been lost in processing or by making appropriate foods serve as carriers of dietary essentials which are inadequately

supplied by many diets. In any case the addition of synthetics to natural foods must depend on the prevention of known deficiencies in groups of the population and not on the ultilization of synthetic products which happen to be available at low cost.

The Council disapproves of unlimited or indiscriminate fortification of general purpose foods with minerals, vitamins, amino acids or other nutrients. It likewise disapproves of artificial combination of edibles designed to carry vitamins, minerals, amino acids or other nutrients for the use of the general public.

I am certain that all of you agree with these general principles and that you are following them in your programs. In fact, food technologists have done much to overcome local practices which have grown up around certain food products and around accepted dietary habits which tend to precipitate deficiencies in population groups. Nothing has been more effective in reducing nutritional deficiencies in this country than the wider and more uniform distribution of milk, meat, fruits and vegetables through the packaging of these products in more attractive and useful forms and through the availability of these products at relatively lower cost. But modern food technology has gone much further. For example, the availability of vitamin D milk has practically eliminated rickets in the children of this country. The enrichment program which returns to white flour and bread, the essential nutrients lost in milling, has done much to safeguard nutrition of many groups of people. These programs were not carried out without great cost and effort on the part of the food industry. You have done an excellent job. However, lest you might become too complacent it is apparent that greater progress could be made in certain areas, to mention one, iodized salt. It is difficult to determine why the iodized salt program has not progressed better but I am sure that something constructive can be done if everyone concerned does their part.

In order to plan the best program for this country we must have a continuous tabulation of the composition of food products as consumed. The need for such information became very critical during the war and in 1942 the Office of the Quartermaster General requested the Food and Nutrition Board to assemble, coordinate and appraise the available data on food composition. The resulting table was finally published as U. S. Department of Agriculture Miscellaneous Publication No. 572. In spite of the extensive information in this publication, figures for many prepared foods and for special or formulated products are omitted. Unfortunately interest in gathering additional information and revising these tables also has lagged since the end of the war. Certain industries are continuing to stimulate interest in this field such as the National Livestock and Meat Board and the National Canners Association and the Can Manufacturers Institute. I cannot help but comment on the data accumulated through the efforts of the latter group because of the extensive type of sampling and analysis which has been done. In some cases there were as many as 100 different samples collected and analyzed and when this was done the figures began to have a real significance.

No one realizes better than I do the difficulty in getting research workers interested in such routine determinations. However, I believe there are still sufficient pitfalls in most of the analytical procedures to make the work interesting and stimulating. It will undoubtedly remain for the food industries to maintain more interest in this program. If Tables of Food Composition are kept up-to-date and used properly, food technologists and the food industry can continue to improve the nutrition of all our people. I hasten to add that there are many dangers from relying entirely upon such tables. The fact that a diet meets the recommended dietary allowances as calculated from these tables, does not mean that the diet is optimum in all respects or that if the diet is not complete a fortification program should be

initiated immediately. Research on further dietary requirements and on the interrelationship between known nutrients must be continued. I suppose the best example which can be cited is the recent demonstration of the relation between niacin and tryptophan. If this relationship had not been established we might have continued to speak of milk and eggs as foods low in niacin along with corn and we might have gone so far as to suggest the fortification of milk with niacin. Today we know definitely that pellagra is associated with the consumption of corn not only because it is low in niacin but also because the corn proteinzein, is low in the amino acid tryptophan. Meat is an excellent antipellagra food because it is rich in both niacin and tryptophan. Milk and eggs are good antipellagra foods because they supply adequate amounts of tryptophan. These studies have clearly indicated that the addition of niacin to corn meal can compensate for both the deficiencies in this food product. Therefore, if corn is to be used it should either be fortified with this vitamin or used in conjunction with milk, eggs or meat, which supply extra amounts of tryptophan. These observations lead to the suggestion that much could be done to improve the quality of diets in many areas through the manufacture of food mixtures. If these combinations were prepared commercially and distributed properly, it would be impossible for population groups, due to dietary habits, to eat incomplete diets. There is some tendency in this direction at the present time and I imagine further advances will be made.

Great effort went into the production of complete and concentrated rations for the use of our military forces during the war. I believe the need for such rations will continue and perhaps increase not only for militry purposes but for certain civilian requirements. Many studies were made on the nutritional adequacy of these rations and the available assay procedures indicated that the better known nutrients were present in sufficient quantity. However, more recently actual feeding trials with experimental animals have indicated that these rations do not give optimum growth in young animals. This is not tooo surprising when several workers, especially R. R. Williams, have found that natural foods combined according to the pattern of the American diet, do not produce maximum growth in the rat and do not allow normal reproduction. Let me quote Williams' statement: "A total of 78 pairs of rats and their progeny were involved in our study. The experimental diet consisted of an intimate mixture of about 65 articles of food which are most prominent in the American diet, in the approximate proportions in which they are consumed. The diet was inaugurated in late January, 1941, during the late stages of the pregnancy which gave rise to the litters from which these 78 pairs were selected, and was continued through a period of about nine months. Growth of the original young was normal and no suspicions arose until the progeny of these young began to appear. The mortality among the young of the second generation was very high, ranging from 20 to 80 percent and averaging about 50 percent for the entire period, without any indication at any time of a difference between one group and the other.

Most of the deaths occurred at birth or within a day or two thereafter. Many young were destroyed by the mothers as they approached weaning age. The young which survived were, without exception, stunted in growth, attaining weights of from 30 to 45 grams at 28 days of age. They appeared anemic and their fur was stained brown and was greasy and matted. A number of maternal deaths occurred near the end of term. In addition, some five males and seven females became quite sterile. Two of these females recovered fertility after transfer to the Sherman diet—one-third whole milk, two-thirds whole wheat— for ten days to two weeks. Several other mothers later also reared normal young after transfer to this diet."

One reason for these poor results may be due to the lower protein content of such a ration and because of the higher requirement of growing experimental animals for certain amino acids. However, there may be other factors involved which need further study. We have recently found that with some of the concentrated rations definite improvement can be obtained by adding 5% of casein and a higher level of all of the available B vitamins. In fact, if all of the B vitamins are increased we need only to add the amino acid methionine. If casein is used the only B vitamins which need to be added are biotin, pyridoxine, and folic acid. With other rations, somewhat different combinations are effective but again we see a very interesting relationship between amino acids and vitamins.

I mentioned earlier that consideration was usually given first to the effect of processing on the nutrients present in largest amounts. Considerable atention has been given to the possible effects of heating and drying on the quality of protein in natural foods but relatively little accurate information has been obtained. Part of this is due to the fact that most of the determinations had to be made through animal experimentation and under these conditions it was difficult to demonstrate small changes. The improved methods for amino acid determinations which have been developed recently give us an opportunity to measure more accurately any changes in the amino acid content of proteins during processing. However, the amino acid composition based upon acid hydrolysis does not necessarily indicate the extent of liberation of these amino acids from the protein during enzymatic digestion. Two years ago, we studied the liberation of essential amino acids from raw and properly heated soybean meal. The use of the proper amount of heat treatment not only destroys the trypsin inhibitor present in raw soybeans but may also alter protein in such a way that it is more readily attacked by proteolytic enzymes. A definite increase in the rate of liberation was noted in the case of each amino acid studied after short-time heat treatment. When prolonged heat treatment was used we not only observed a decreased rate of liberation of most of the amino acids with pancreatic digestion but the recovery of lysine, arginine, and tryptophan was reduced even after complete hydrolysis. It is interesting to point out that in animal feeding trials it was found that the overheated meal needed to be supplemented with both lysine and methionine in order to obtain optimum growth. Apparently the heat treatment altered the lysine but only affected the rates of release of methionine. More recently we have repeated these studies using casein as the protein. The casein was autoclaved for 4 minutes and for 20 hours and 16 different amino acids were determined after enzymatic and acid hydrolysis of raw and the two heated caseins. In this case the only change observed after total hydrolysis of the casein was in the case of cystine. The different results obtained with casein and soybean meal is undoubtedly due to the presence of carbohydrates along with the proteins in the soybeans. This indicates that completely different results may be obtained during the heating of complex food mixtures. When the caseins were digested with the different enzymes it was found that the 4 minute treatment increased slightly the rate of liberation of all the amino acids but after the 20 hour treatment little effect was observed with pepsin hydrolysis but there was a definite decrease in liberation after pancreatic and erepsin hydrolysis.

The rate of release of the different amino acids after successive treatment with pepsin and pancreas and erepsin was very interesting. Aspartic acid, cystine, histidine, isoleucine and proline were liberated rather slowly, while arginine, methionine, phenylalanine and tryptophan were liberated very rapidly. When the digestion was allowed to continue for long periods of time the liberation of cystine increased but the amount of proline and aspartic acid released remained very low.

The availability of these amino acids may have profound effect on the quality of protein, especially when the protein intake is limited. Whether there are other factors associated with protein which may be altered during food processing is difficult to decide at the present time. Woolley has suggested the presence of a peptide in certain proteins which he has designated as strepogenin. The true significance of strepogenin in animal nutrition has not been determined and we do not know whether it is subject to destruction during cooking and food processing. However, I believe these questions can be answered in the near future.

In the case of rats, rather good growth can now be obtained by feeding them a mixture of pure amino acids provided some of the nitrogen is supplied in the form of glutamic acid and other non-essentital non-amino acids. The effect of glutamic acid is of significance in light of its extensive use in flavoring food products. Improved growth can be obtained by carefully balancing the ratio of some of the essential amino acids. However, even so, we have been unable to obtain a growth greater than 20 gm. a week over a 4 week period. If this amino acid ration is supplemented with intact protein as 5% casein, growth equivalent to 30 gm. a week can be obtained. Egg albumin gives the same response as casein and since Woolley has shown that egg albumin does not contain strepogenin these results at least suggest that the beneficial effect is not due to strepogenin. Furthermore, we can obtain a growth of 30 gm. per week by feeding an acid hydrolyzed casein supplemented with the amino acids which tend to be destroyed or which are low in casein. These results tend to indicate that the factor involved is not strepogenin, but a peptide or even an unrecognized amino acid may still be involved. However, we must not overlook the fact that the amino acid mixture which has been used contains some D-amino acids and the reduced growth may be related to the possible detrimental effect of some of the unnatural forms. Very recently we have obtained almost normal growth in mice on a mixture of properly balanced amino acids. Apparently this species is not as susceptible to D-amino acids or does not have as high a requirement for additional factors.

It is also interesting to point out that in the chick, reduced growth is obtained when we use a plant protein such as wheat gluten in spite of the fact that compensation is made for the known amino acid deficiencies . It is apparent, therefore, that a great deal more work on protein and amino acid requirements is needed but it appears that rapid progress will be made in the next few years. When such information is available, the effect of food processing on the protein part of our diet can be carefully studied. Optimum nutrition cannot be obtained without paying attention to all essential nutrients; and food processing will not be successful until recognition is given to each of these essential nutrients. The possibilities for the future are tremendous. Better distribution of high quality natural foods can be continued and improved. Nutritional value of some of these natural foods can be increased by the proper type of processing. Certain combinations of foods may be not only more appetizing but more highly nutritious. The availability of synthetic vitamins and perhaps other nutrients in synthetic form will help in the improvement of foods if they are properly used. However, in any case, modification and changes may be carried too far and that is why we need to have research workers in this field to tell us where to go and how far to go.

FIRST PRESENTATION OF STEPHEN M. BABCOCK AWARD

PHILADELPHIA, PENNSYLVANIA, JUNE 9, 1948

This award was presented to Dr. Frederick C. Blanck for outstanding contributions to the field of food technology which influence public health through more nutritious food.

Dr. Blanck is a past-president of the Institute of Food Technologists, past-president of the Association of Official Agricultural Chemists, past-chairman of the Food and Nutrition Section of the American Public Health Association, past-chairman of the Agriculture and Food Division of the American Chemical Society, and is a Fellow of the American Public Health Association and of the American Association for the Advancement of Science.

STEPHEN MOULTON BABCOCK

Stephen M. Babcock was born at Bridgewater, New York, on October 22, 1843. Even as a boy he displayed the natural inquisitiveness of a scientist. Throughout his lifetime he was continually asking questions, not only of others but of himself and the world about him.

He received the B.S. degree from Tufts College in 1866, and then entered Rensselaer Polytechnic Institute in 1867, intending to specialize in engineering. Death in the family forced him to return home and assume the responsibility of operating the farm. From 1868 to 1872 he continued this farm work, simultaneously working part time in the chemical laboratory of Dr. G. C. Caldwell of Cornell University. Contact with this outstanding teacher inspired him to continue his education, and so from 1877 to 1879 he studied under Woehler at the University of Göttingen in Germany. In 1879 he received the Ph.D. degree.

Upon his return from Europe he was appointed Instructor in Chemistry at Cornell, but in 1882 was called as chemist to the New York Agricultural Experiment Station at Geneva. In 1888 he went to the Wisconsin Experiment Station. There he remained for 43 years of his life span.

His pioneer spirit would let him spend little time in poring over the writing of others to classify knowledge that already existed. The laboratory, not the library, was where Babcock sought the truth. In spite of this, he firmly believed in scientific libraries. When he went to Wisconsin he was unable to begin work at the start of the semester, and asked that his pay check for this period of absence be turned over to the Agricultural Library to purchase certain scientific journals. In his will half of his estate was bequeathed to the University for the purchase of books.

It was Babcock's refusal to adopt the then prevalent theory that completely balanced ration could be constructed on the basis of chemical analysis that later led to the epoch-making discoveries in the field of vitamin research, and the role of minerals in animal nutrition. While at the Geneva Experiment Station, he was assigned the task of building up data on the analysis of feed mixtures consumed by an animal, and the resulting waste products it threw off. He soon realized that if the mineral constituents were disregarded there was a striking similarity in the chemical analysis of both the feeds and the resultant wastes.

He next designed experiments to find out what would happen if animals were fed chemically balanced rations made wholly from single plants. His now-famous experiment on just two cows was one of the early demonstrations of the existence of accessory nutritional factors. One cow was fed a "completely" chemically balanced ration made from the corn plant, and the other a ration "equally" nutritional chemically but made wholly from oats. In three months the oat-fed cow died, whereas the corn-fed cow prospered and grew. We now know that corn contains a vitamin lacking in wheat and oats. No more fruitful researches have been made, no richer returns have been made to the science of animal nutrition than these "single grain" studies.

Although it is of no greater significance than some of his other work, the accomplishment for which he is best known is his famous test for measuring accurately the butterfat content of milk. As long as butter was produced on the farm no test was necessary. But with the development of the factory system for better production, it became of prime importance to be able to differentiate between milks of varying richness.

The development of a simple rapid accurate test for butterfat in milk was assigned Dr. Babcock. He developed several methods that worked fairly well, but he was not satisfied until he devised a test that could be applied to all types of milk satisfactorily. How thoroughly the test was perfected is evident from the fact that the technical details of the test remain essentially unchanged after a lapse of more than 50 years.

In collaboration with H. L. Russell, Dr. Babcock discovered that the reduced consistency of pasteurized cream is due to the breaking up of the fat globule clusters in milk, thus impairing the whipping properties of the product. A practical means of restoring this property was devised through the addition of a few drops of quicklime dissolved in a cane sugar solution.

It was also discovered that milk contains a hitherto unrecognized enzyme which was named galactase. Its action on the casein component of cheese caused this insoluble protein factor to break down and become more soluble. This discovery led to the development of the process of curing cheese at 60° F. or lower instead of room temperature, which, in turn, made it possible to produce cheese of much improved quality.

Dr. Babcock did much fundamental exploratory work which laid the foundation for a new conception of the science of nutrition. His work was directed toward production and processing which made him a pioneer of food technology.

Many awards were bestowed on Dr. Babcock during his fruitful lifetime. Among them were:

1. Testimonial medal of the Wisconsin Legislature for his service to the State (1898).
2. Grand Prize for his fat test at the World Exposition in Paris (1900).
3. 1901—Tufts College, his Alma Mater, conferred on him the honorary degree of Doctor of Laws.
4. 1904—Grand Prize for his fat test at the Louisiana Purchase Exposition at St. Louis.
5. 1916—Babcock "Silver Jubilee."
6. 1917—Honorary degree of Sc.D. by the University of Wisconsin.
7. 1930—Senator Capper Award for Distinguished Service to American Agriculture.
8. 1931—The University of Göttingen renewed his degree of Doctor of Philosophy.

In 1893, he served as President of the American Association of Official Agricultural Chemists.
On July 1, 1931, Dr. Babcock died at the age of 87.
Inventor of a method that emancipated the dairy farmer from the rule of thumb!
Trail blazer in the important field of vitamin research!

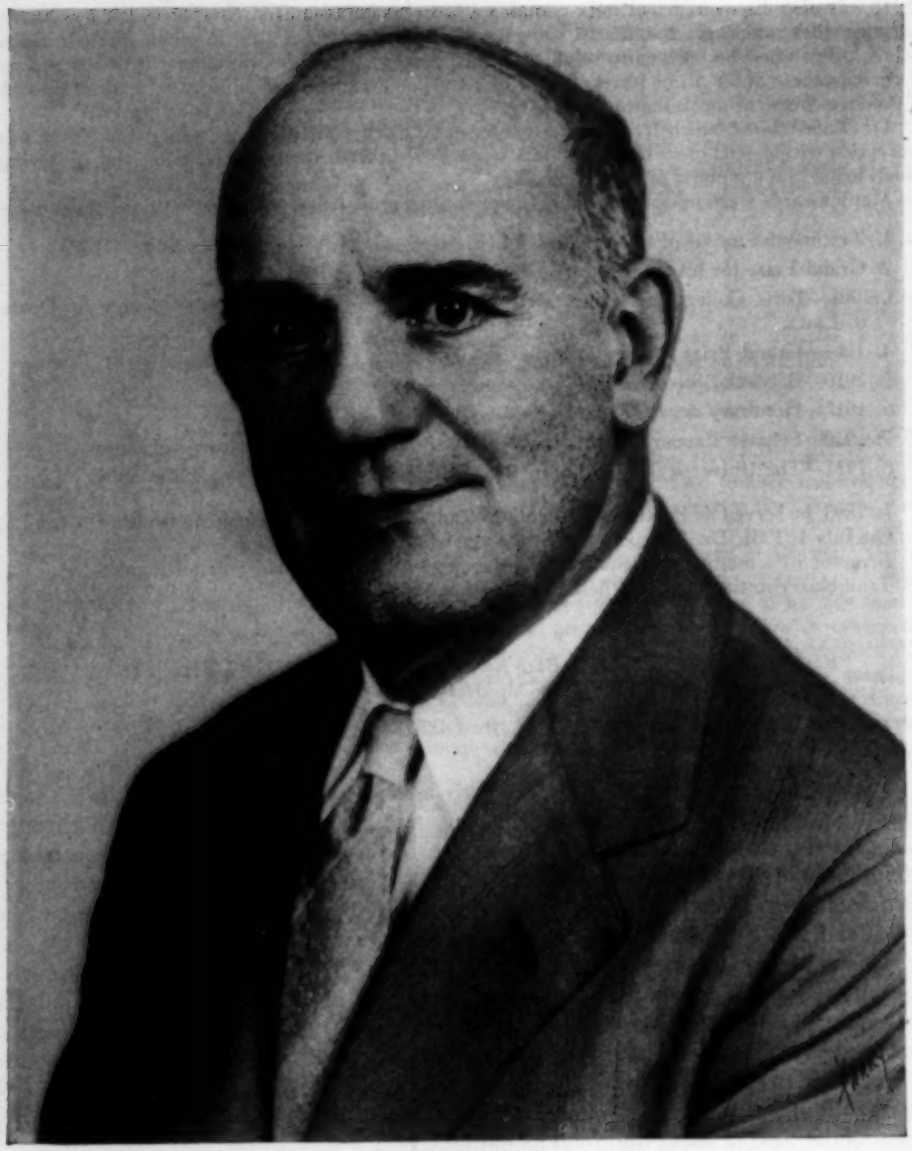
REMARKS BY FRED C. BLANCK UPON RECEIVING THE FIRST STEPHEN M. BABCOCK AWARD

President Hucker, fellow members of the Institute of Food Technologists and friends:

In accepting this award, I do so with a deep feeling of humility and a keen realization of my own minor contributions to the cause of better health through better foods. Instead I accept on behalf of those well-trained, highly specialized scientists who have been my coworkers through these many years. I feel that my participation has been that of a catalyst to speed up or assist in the reaction and occasionally to contribute an idea.

It is quite customary on such an occasion as this for an older person to reminisce and recount his experiences in the hoary past. But today, we are living in the present and, I hope, looking toward the future. Again, as I look at this fine audience, I am happily impressed with the preponderance of youth and that tomorrow's world is what our present young generation makes it. So in my few remarks, I want to leave with you a few suggestions which I have found useful in an experience of forty years in the field of foods and food technology:

1. Your technical or professional education never ends.
2. Develop a cooperative attitude toward your fellow workers. Team work is always better than individual effort.
3. Broaden your scientific horizon so as to visualize all the problems of your particular assignment or job.
4. Develop your power of expression to turn out logical, brief statements of your work and accomplishments.



FREDERICK C. BLANCK
Administrative Fellow, Mellon Institute of Industrial Research
University of Pittsburgh

5. Recognize that you are an integral part of the organization of which you are a member, and that your proper functioning is necesary to the success of the entire organization.
6. Do not be dogmatic, your fellow workers' ideas may be just as good as your own.
7. Do not hesitate to say "I don't know" when you are asked a question. Bluffing has no place in a scientist's equipment.
8. Be an attentive listener, ask sound questions and *ab*sorb, not *ad*sorb, new ideas.
9. Develop your ability to give adequate verbal expression to your ideas on a given subject.
10. Take a healthy interest in extracurricular activities such as community service, welfare and recreational activities of your fellow workers so that you are not branded as a man with a one-track, scientific mind.
11. Study individuals so that you can determine their strong as well as their weak points. This is especially important because later you may have the responsibility of selecting personnel. In other words, develop by reading, observation, and experience a practical knowledge of human psychology.
12. Develop salesmanship both for yourself and your work.

As Mr. H. N. Riley stated on the opening day of our Convention, "we are all V. I. P.'s in the field of food technology." We can only become very important people in our field by work and more work, by throwing into our daily work that enthusiasm which indicates that we are laboring in our chosen field. Surely there is no higher reward for any of us than the personal satisfaction of doing a good job in a field which means so much to the health, peace, welfare, and spiritual satisfaction of mankind.

Industrial and Legal Viewpoints

TECHNICAL FISHERIES EDUCATION SEMINAR[a]

The need for food technologists with specialized training to conduct research for the fisheries industry is discussed by technologists with the problems of industry in mind. Government financed fishery research in Canada is briefly reviewed.

Dr. Carl R. Fellers: The purpose of this round table is to consider present educational facilities for training young men in fisheries technology. There is a revival of interest in this field. Very little has been done to date by federal and state governments for the fisheries industry. Agricultural subsidies have greatly assisted American agriculture. No such subsidies have helped the fisherman. All forty-eight states have low-cost land-grant colleges and secondary schools for instruction in agriculture. Why isn't anything done for fisheries? Education in fisheries is now conducted mainly from a biological viewpoint. The industry needs food technologists. There is need for courses in fisheries technology in some of our universities. Japan, Canada, and some European nations have done far more than we have in training technologists for the fishing industry. What steps are necessary to get an educational program under way?

The fisheries industry has complained that it could not get fishery technologists. There is an increasing awareness that fisheries are as important as agriculture. You cannot be a fishery technologist until you are a food technologist. The hope is that the Institute of Food Technologists will bring out the necessity of increased educational facilities in fish technology and be of service to the fisheries industries.

Mr. R. T. Whiteleather (U. S. Fish and Wildlife Service): Technologists are readily available in all other fields, yet not in fish technology. One suggestion has been to incorporate fish technology training in state colleges. So far, such an arrangement has been unsuccessful due to lack of funds. A solution would be to establish at food technology schools joint facilities for fishery technology. The Fish and Wildlife Service would like to work co-operatively in getting better training for fish technologists. It was once thought that students might be taken in the government laboratories for training, but the difficulty arose that the men in the laboratories have little time to devote for students, since they have their own programs to complete. The University of Washington Fisheries School is now re-establishing a technological course. Although many food technology courses are given in this country now, they do not have the proper fishery slant desired in the Fish and Wildlife Service.

Dr. Fellers: A letter received from Dr. W. M. Chapman of the University of Washington School of Fisheries was read. It stated that in past years the emphasis has been on training in Fisheries Biology, and that only in the past two years has the school re-instituted training in Fisheries Technology. Now they have proposed to go a step further by initiating next fall a full year of laboratory courses in Fisheries Technology. Some examples of courses are: Canning and Curing of Fish; Refrigeration of Fish; and Preparation of Fish By-Products.

"It will be our intent in our technology courses, as well as our biology courses, to build upon the basic scientific training obtained by the students in the other

[a] Seminar conducted by Dr. Carl R. Fellers, Head, Food Technology Dept., University of Massachusetts, Amherst, on June 9, 1948, at the Eight Annual I. F. T. Convention, Philadelphia, Pa.

departments of the University. It is our function to act as a bridge between the academic departments of the University and the outside, practical world of the fish business. In our fisheries technology we will build upon a thorough training in chemistry and bacteriology. Our students come to us as juniors, seniors and graduates. We have little dealings with freshmen and sophomores.

"There appears to be two different demands for fisheries technology training here: 1. From students in general Food Technology who desire some acquaintance with the special problems of fisheries technology, and 2. From fisheries students who desire to know something about fisheries technology and the workings of the fish business. We will try to shape our courses to fit these demands equally well."

Mr. Norman D. Jarvis (U. S. Fish and Wildlife Service and graduate of the University of Washington): The emphasis in fishery courses has been changed from technology to biology because the training was considered too practical. However, the school's new program aims to relate the experience of industry to what the University has to offer.

Dr. Fellers: Practical training should be superimposed on fundamental science; the details should be left to industry. This is the same as in food technology—fundamental training, such as chemistry, physics, and biology, is needed first. However, there are specialized problems in the fishery industry. Perhaps incorporation of fish technology courses would be desirable.

Dr. W. F. Hampton (General Seafoods): There are many problems in the fisheries industries, and we are way behind in many respects. The industry is made up of of many small units, which are not ready to pay the price for highly trained technologists. The industry does not realize what technology can do for them, especially the smaller groups. However, the bigger industries have a greater understanding of the matter. It might be useful to approach industry to see their opinion on the matter.

There is much technological knowledge dormant in the industry and we should apply what has already been found. The job of applying this knowledge is not at the level of the college trainee. The foreman and plant worker are the ones who must be educated to the importance of the process they are handling and are the factors which must be approached with caution.

The suggestion is made by Dr. Hampton that arrangements be made for food technology curricula to incorporate fisheries courses. He states that we need to train plant managers first.

Mr. H. E. Crowther (Atlantic Coast Fisheries Co.): Only a few laboratories would hire technologists, for they are afraid of anything which would change their age-old business practices. In the fisheries industry, experience has been the major factor in getting a catch, not formal education. Thus, the fishermen begin to train their sons at an early age in the practical application of fishery knowledge.

First of all, I believe that everyone connected with fishery technology agrees that some sort of an educational program is needed to provide the industry with a larger number of trained technologists. At this time I do not believe it will be advisable to institute an entire course in fishery technology in colleges. Instead, I believe it will be better to have specialized fishery technology as a postgraduate course, or, if necessary, for juniors and seniors in the undergraduate course. By this method the students who have chemical and bacteriological backgrounds will take concentrated fishery courses which will equip them for work directly in the fishing industry as soon as they have completed their college work. In my opinion, it is more desirable to fit fishery technology into a scientific course than to fit scientific subjects into a fisheries course.

My fear in offering a course with major training in fishery technology is that those who have specialized in this course will have a very limited number of openings and opportunities. In all of the New England fisheries, I know of only a few laboratories other than those under government and state control which could or would hire technologists. It has been mentioned that a technologist could start out in technology work for a commercial fisheries company and then work up to a more responsible managerial job. I believe that this would be very hard to do. In the first place, commercial fisheries companies look on technologists and other scientific people with some degree of suspicion. The companies admire the scientists for their general scientific achievements, but when the recommendations of the scientists would affect them personally they are not too cooperative. They are afraid of anything which would alter their routine of doing business.

I have noticed that recently there have been a number of attempts to parallel fishery research with that of agriculture. Personally I hope that a convincing parallel can be drawn so that the fisheries will receive an appropriation in proportion to that which agriculture gets, but I believe it will be difficult. Agricultural schools teach the men all phases of farming, etc. in order that they may put what they have learned into practice on their own farms or on the farms of large corporations. In agriculture they start at the beginning, as in planting and can observe any increases in yields, etc., but the fisheries are not so fortunate. The technologists must take over after the fish are caught. The only recognizable knowledge in this first phase of the fisheries is experience. The captains and others on the fishing boats are depended on to use their experience to find means of catching the largest number of fish. Science has shown very little in increasing the production of any of the fishery products.

In my opinion, before commercial fisheries will employ a large number of technologists it will be necessary for the federal or state laboratories to work out practical processes which will show a real gain for commercial companies. The government work must first progress to a point where fishermen and those who handle fish realize that cutting, packing, freezing and marketing can be science rather than a handed down practice of throwing fish in a box. Much work must first be done by the government laboratories before the technologists can have a fighting chance in the industry. The problem now, therefore, is whether there is enough room in the government laboratories to warrant training men as specialized fishery technologists rather than general food technologists.

Mr. Michel F. Vucassovich (Gorton-Pew Fisheries): It is not enough for the student to learn only the theory of the food industry—he should also have practical training. Formal education during the winter, and actual experience in industry during the summer is the best plan. Very few firms are at the present time able to hire fish technologists.

Dr. Fellers: A substitute for the short course is to have a technologist in the plant who runs a short course for the plant manager and workers.

Dr. Hugo W. Nilson (Fish and Wildlife Service): There is a parallel between agricultural and possible fisheries courses—there is the agricultural high school, which is attended by farmers' sons who can then go back and run their fathers' farms or operate one for a landlord. There is also agricultural training at the college level. Courses should be added in agricultural colleges for fisheries. The student should also have a certificate showing he has had six months in practical experience.

Mr. Fred H. Dellwo (Ball Brothers Company, Muncie, Indiana). In describing fisheries training at the University of Washington in 1931, he said that there were many good students in his class but that all went to other fields because the industry

did not support them. The industry is slow in catching on to modern ways of doing things. A course that gives broad technical training is the most practical.

Dr. H. B. Switzer (Good Housekeeping Bureau): The fisheries industry is years behind in its idea of what constitutes quality food. With the present level of appreciation of technology, the industry might hire a technologist and then give him no backing; simply hire him as a handy man. We must sell "top brass" on the idea of modernizing. A national school of fisheries should be established with three branches on the Chesapeake, Gulf Coast and Pacific. The U. S. Fish and Wildlife Service should ask for funds from Congress.

Mr. S. G. Harris (Blue Channel Corp., Beaufort, South Carolina): I have felt for many years the lack of college trained technical men in the sea food industry. I am a graduate of agriculture from Pennsylvania State College. I know of the thousands of men well trained and graduated in agriculture from the state colleges and Universities of this country. Much of the advancement of scientific agriculture, or the progress of the farmers in the rural back-ways, is due to these men.

As far as I know there are not over two Universities offering any courses in fishery studies in this country, and these, I believe, are biological studies. I especially feel the great need for men trained in food technology and fisheries in my industry. Today I take college men trained in food technology but without training in fisheries. It requires one or two years to train these men in the fundamentals of fishery canning which could have been acquired in college courses.

I believe there are unusual opportunities for college men in the sea food industry. It is one business and industry which has been greatly neglected, and for this reason offers great opportunities. Today, with so many professional and industrial fields so well manned, the country should train more men to take advantage, and to promote the fisheries industry. I recommend strongly that a National School of Fisheries be established by the Federal government somewhere on the Chesapeake Bay, and another one somewhere on the Pacific Coast, and another one on the Gulf Coast. These three schools should be separate and not departments of existing universities. I believe that committees should be formed in each of these three areas and plans made, supported by the fisheries industry, to present these needs to Congress as soon as possible.

Dr. Ellis (Atlantic Fisheries Experimental Station, Halifax): There are two levels of fisheries education, basic research and technical training. The industry should not have to do basic research, as it has too many of its own problems to follow.

Another level of education is through the fishermen themselves—courses in navigation and handling of fish, thus getting to the basis of the subject.

Dr. W. A. Maclinn (Head, Department of Food Technology, Rutgers University, New Jersey): Food Technologists have not made the fish industry want them. The Fish and Wildlife Service should sponsor programs and get technical people at fisheries conventions to tell them the importance of technology. The industry can be sold on food technologists.

Dr. L. W. Strasburger (Karl Envoldsen Company, New Orleans): Some say there are few opportunities for food technologists, but he takes serious issue with this statement. There is an increasing demand for help from people in the fish business who want to improve the quality of their product, producing those of which the housewife will approve. This calls for better methods of production and plant sanitation. Men basically trained in food technology coupled with a definite specific fish technology training are urgently needed. People should get their training in the field, then go back to school for technical training.

Dr. H. L. A. Tarr (Pacific Fisheries Experimental Station, Vancouver): There are only a few schools of fisheries and they have not turned out many graduates. If the industry is to develop new products from fish, it must have technologists. It must also have laboratories and employ chemists and other scientists.

The Federal Government (Canada) has financed fishery research for many years, the grants being administered by a Board which consists of university professors and members of the fishing industry. Originally this Board was known as the Biological Board of Canada, and a little over ten years ago the name was altered to the Fisheries Research Board of Canada. The Board now operates three biological and three technological research stations. It is interesting to observe that the scientific members of the staffs of these stations have rarely, if ever, themselves graduated as trained fishery students. Most of them have obtained degrees in pure or applied science in subjects such as chemistry, biochemistry, bacteriology, physics, engineering, biology, zoology, etc. and have quite frequently picked up a knowledge of practical fisheries subsequent to their appointment. This method seems to have worked out fairly satisfactorily so far. The view is held by some that better work is frequently accomplished by bringing a man with no special knowledge of a given field of applied work into a vacant post, and then letting him bring entirely fresh and original ideas to bear on the problems. This will usually succeed if the appointee has good basic training and plenty of imagination and initiative. The suggestion is therefore put forward that basic and new scientific work in fisheries be carried out by scientists who are not necessarily graduates of fishery courses. Where then will fishery courses fit in?

There has been a tendency to generate fishery education in certain Canadian Universities. Thus the University of British Columbia now offers a fishery course, emphasis being laid at the moment on the biological and commercial aspects of the subject rather than on technology. It would appear that there is a definite need for skilled, practical fishery technologists, especially in the industry and in certain government posts such as inspection services. The training required for posts of this type will of necessity be rather general, and should perhaps not be designed to fit a man to carry out research. The fishing industry is probably *at least* 25 years behind the dairy industry in many respects of processing and sanitation, and it will take many skilled technologists to modernize it. A degree course in fishery technology should first require that the student have a fair grounding in general sciences such as mathematics, physics, and chemistry. Subjects which the student will find particularly valuable are organic and biochemistry, bacteriology, and some mechanical engineering or chemical engineering. Training in biology and histology may also be of value. Of all subjects chemistry is probably most important for without a good working knowledge of this subject the technologist is lost. In the last year or two the student should try to obtain employment in a fish processing plant so that he will get some idea of the practical problem involved. The following is a brief list of some of the subjects with which an efficient fishery technologist may have to acquaint himself.

1. *Fresh fish.* Catching methods. Dressing and washing fish on vessels. Methods of icing and stowing fish. Landing gear and methods. Handling fish on shore. Re-icing for transportation. Washing methods before filleting or steaking fish. Brining of fillets or allied treatments. Wrapping, packaging, etc.

2. *Frozen fish.* Methods of freezing whole dressed fish. Glazing of fish and value of special types of glazes in preventing undesirable alterations. Storage temperatures and reglazing of fish. Methods of plate freezing fish fillets, relative value of wrapping materials in preventing desiccation.

3. *Smoked fish.* Methods, old and modern. Types of controlled smoke houses. Temperatures, humidities, types of wood sawdust used. Dyes, brining, hot smoking, hard smoking, keeping quality of smoked fish. Storage of unfrozen and frozen smoked fish.

4. *Canned fish.* Mechanical methods of cutting fish. Filling machines. Weight checking. Salt adding machines. Exhaust box and ordinary closing machines. Vacuum closing machines. Retorting temperatures for different cans. Labelling, boxing, etc.

5. *By-products.* Fish meal and oil. Reduction processes commonly used. Types of waste and relative value. Recovery of press liquors (stickwaters). Recovery of body oils in reduction plants. Storage of reduction plant meals and oils. Fish liver oils. Methods of determining vitamin A. Methods of alkali extraction of fish visceral and liver oils for use in animal foods or for pharmaceutical purposes. Storage and transportation of fish oils. Possible value of development of other by-products such as glue, protamine, proteolytic enzymes, cholesterol from meal and body oils, etc.

6. *Insulation and refrigeration.* Insulation and refrigeration of fishing vessels. Insulation and construction of cold storages for fish. Compressors and freezing equipment. Refrigerated transport by railway cars (type of cars) and trucks.

These are only very general headings, and it is possible that I have left out several important subjects.

In universities in which a department of food technology already exists the initiation of a specialized fishery course might not prove difficult, especially if the fishing industries offer some co-operation. It is doubtful if many universities could afford to create a full time chair of fish technology, but it would probably be possible to appoint an assistant or associate professor under the department head who would be expected to devote all or a considerable portion of his time to instructing fishery students. Naturally it would prove extremely advantageous, if not essential, that the fishery school be located within reasonable distance of large fishing centers, either on the coasts or near lake fisheries. Until such time as fish technology courses have been planned it would seem important that the men who may be appointed to teaching posts have an opportunity to meet at least once a year, perhaps at the occasion of annual I. F. T. meetings, and there discuss types of courses which should be given in order to coordinate the material taught.

Mr. G. A. Fitzgerald (Frozen Food Foundation): There is some confusion as to how industry and technology can get together. The fisherman is not interested in food beyond the deck and the processor or packer already has so many expenses that he is not interested in the additional expense of employing technologists and setting up laboratories.

Mr. W. J. Mahan (General Foods Corp.): Agrees with Dr. Hampton and Mr. Fitzgerald. Instructors will not teach courses where jobs are non-existent. Industry needs research very badly, but no one will pay for it at present.

Dr. Robert S. Breed (N.. Agric. Experiment Station, Geneva): The thing that industry and technologists need is research work. Men trained in technical fields should have practical background. Those brought up in the work do best on a job. Industry does not yet appreciate what technologists can do for them—they must sell themselves to industry.

Dr. Hampton: The best approach is education at a lower level.

Dr. Karl Envoldsen (Karl Envoldsen Company): What is needed by the industry are good food technologists—not a fish technologist. We should get fishery

owners to send their sons to technology courses. They can then see the importance of the training and help to educate the industry.

Mr. J. M. Lemon (U. S. Fish and Wildlife Service): There is also an international demand. If students could not find work in this country, they might find jobs abroad. Now is the time to train technologists before the competition in the fisheries industry gets any greater with other nations.

Dr. A. S. Levine (University of Massachusetts): From the standpoint of the student, we owe the student in food technology a brief contact with the fish business to see if he likes it, and to overcome his psychological resistance to entering a new field he knows nothing about.

Mr. Ives Jean (Ecole des Pecheries; St. Anne de la Pocatiere): The College has found it difficult to adapt theory and practice. The work is largely practical. There is the requirement that a student must work for three summers. Only six professors are available in the College for teaching the courses. The school has placed hundreds of young men in the Quebec fisheries.

Mr. W. J. Mahan: If industry is not ready for technical programs now, it is not ready to be in business. Kettering is quoted: "If you wait until research is needed, it is too late to start." You should do a selling job to the students and to industry.

Mr. Joseph F. Puncochar (U. S. Fish and Wildlife Service): In any kind of fisheries course, instructors need material. There is a lack of text-book material. The men in the industry should do writing in their field—there is a lot of material but it is scattered.

Dr. Fellers: In summarizing, a full course in fisheries technology seems not practical at this time except perhaps for one or two institutions. Fish technology courses should be part of food technology—perhaps one or two courses in the 4 or 5 year program. There is need for non-degree short courses in technology, sanitation and other aspects of the fishery business. Both trained scientists and engineers as well as men trained in the industry should be used in instruction in fisheries technology.

Dr. M. A. Joslyn: The University of California will work towards establishing courses. It would be a good thing for the Institute of Food Technologists to sponsor a program in fishery technology education.

Mr. A. Fieger (Baton Rouge): If industry would get together with the Federal Government, then there would be definite results and the industry would realize the importance of technologists.

Mr. Mogens Jul (Director of Fisheries Technology, F. A. O.): Dr. Fellers and the Institute of Food Technologists are to be complimented for taking up the problem. The importance of education of fishermen, foremen (done in Norway) and of fisheries technologists will get results. Plenty of education is needed.

About 65 persons were present at the Seminar.

Notes and Letters

THE ROLE OF CONTROL INSTRUMENTS IN CONTINUOUS FOOD PROCESSING*

(Condensed)

L. E. SLATER

Industry Engineer, The Brown Instrument Company

One of the major advantages of continuous food processing is the use of small capacity equipment because of the remarkable speed of product flow. When food being processed is in constant movement all processing factors are apt to be in a continual state of flux. Temperature, pressure, flow, liquid level and all variables associated with them may fluctuate undesirably during operations unless properly regulated and controlled.

Food products are very sensitive to small variations in the conditions of process. Continuous processing, therefore, demands rigid measurement and control of these variables within carefully prescribed limits and thus makes it mandatory that the instruments employed be precise in their measurement and regulation of these variables.

There is in addition to the variables mentioned (temperature, pressure, flow, and liquid level), instrument controlled variables introduced by continuous processing such as pH, humidity, electromagnetic irradiations, speed, time, and vacuum. These variables are measurable and, therefore, controllable process conditions.

A further list of physical and chemical properties related to product quality such as color, density, specific gravity, moisture content, viscosity, and refractive index, have previously been measured on the finished product and were considered as laboratory quality measurements. The use of process control instruments make these tests possible during processing and is a control of what *is being done,* rather than a measure of what *has been done.*

Laboratory quality measurements can now be made continuously during process because of remarkable advances in industrial instrument design and the ingeniousness of process men in applying these tools.

An example of the blending of process control and product quality is illustrated in the processing of tomato juice. During the evaporation of tomato juice a direct and continuous measurement of product density is taken as it leaves the separator by a comparative method utilizing a differential manometer. From this measurement the product is automatically recirculated through the process equipment if it be below the desired density.

The roasting of certain flake-type breakfast cereals is another example of continuous processing control. Product color is measured continuously by means of a photronic pickup which in turn allows an instrument to control the speed of the conveyor through the roasting chamber.

The paper and textile industries have for some time utilized the direct and continuous measurement of moisture in the product during process and automatically reset temperature controllers on rollers and drums. There is evidence that similar instrumentation may be applied to certain processes in the grain and dairy industries.

The expanding list of variables that are being successfully dealt with by automatic control instruments would indicate an increasing complexity in the instruments

* Presented before the Eighth Annual I. F. T. Convention, Philadelphia, Pa., June 9, 1948.

involved. Actually the instruments employed tend to simplify and standardize practice by multi-purpose employment. It is the number and complexity of the "pickup" devices which make automatic control possible.

The great majority of these new detecting devices work on the principle of generating a variable electric signal as an index of measurement. Some of these elements are the familiar thermocouple, the conductivity cell, the glass pH electrode, the strain gauge, and the dielectric constant cell. The same basic electronic indicating, recording, and controlling instrument can be utilized in conjunction with these various elements.

The prime qualities of control instruments for continuous processing are speed of measuring response, precision, and accuracy of measurement, and reproducibility of measurements from day to day.

The quality of the control received in a given process greatly depends upon the relation between the rate of change of the variable and the speed of response of the measuring element. If the rate of change is slow we can afford a relatively sluggish element. Continuous processes are characterized by rapid changes in processing conditions and hence require an exceedingly responsive measuring system. The continuous liming of acid juice from cane sugar is an example. Limewater is added through a control valve just upstream of the glass electrode which is measuring pH. The flow of juice may suddenly change or lime concentration may alter. In either case the pH of the juice will deviate from the desired value and if that change is not picked up and corrected for immediately a large portion of improperly treated product may pass down the process line, the amount in this case depending mainly on the measuring lag of the pH control instrument.

Temperature is the most important controlled variable in most food processing and as such has received much attention from the instrument response rate standpoint. The pressure type thermometer has been the most widely used temperature control instrument in the food process industries and in recent years a great deal of work has been done to increase the speed of response of the thermometer bulb to make it more suitable for continuous process control. Many factors influence the responsiveness of a thermometer bulb, but dominant among them are the mass and thermal conductivity of the material comprising this bulb. The most critical continuous food processes are those involving a direct immersion of the temperature measuring element into the product itself in order to control product temperature. Modern sanitary requirements make the use of stainless steel mandatory in this case, and this material has an undesirably low thermal conductivity. The problem, therefore, has been one of reducing the large mass of the sanitary thermometer bulb without sacrificing some of the operating torque within the instrument. Some interesting work has been done by the British in evolving a mercury-in-steel type bulb which involves a thin film of mercury between double steel shells around a hollow core. Tests have shown this design to have astonishing responsiveness and, no doubt, such a construction will be commercially available shortly.

Many processors, especially in the chemical and oil industries, because of this inherent lag associated with thermometer bulbs, have installed electrical measuring instruments to deal with temperature. While small gauge bare wire thermocouples and resistance bulbs are almost instantaneous in their response, food industry sanitary requirements demand mounting of these elements in a stainless steel protecting well with its associated lag. In addition, the air space between the well and the measuring elements imposes a lag. The problem of increasing response speed here has been found to be one of design involving such techniques as welding in and close tolerances, and sanitary type thermocouple and resistance bulb constructions are now available which demonstrate outstanding responsiveness.

Perhaps the best way of presenting some considerations to guide in improving your process control from the response rate standpoint is a series of "do-nots." Do not use a protecting well for the element unless it is absolutely necessary for sanitary reasons or for reasons of corrosion. Oftentimes such a well will delay corrective action on the part of the instrument by a few vital seconds. Do not use long lengths of thermal tubing with thermometer type controllers. An appreciable lag can occur in the transmission from the bulb to the instrument if they are too remote from each other. This problem does not exist with thermoelectric measurement, since the transmission time is that required for electric current to flow through a wire. Do not place the element so that it is out of the flow of the medium. Thermometer and resistance bulbs must have their total sensitive length in contact with the medium for best results. Oftentimes an undeterminable lag will be found due to the fact that only one-half of the thermometer bulb is protruding into the flow. In the thermocouple, only the relatively tiny "hot-junction" has to be immersed in the product, but again there have been cases where neglect of this location had found the element completely free of the product.

While a responsive measuring element is one of the most important requisites for good automatic control, this control would have no meaning unless the set value of the variable were maintained at a precise and accurate level. This is especially true in the food industry where product sterilization, carried out at an exact and carefully predetermined temperature, is a typical operation. A controller chart can display a fine unwavering record, indicative of excellent control, and appear to be "right on temperature." Yet an accuracy check will reveal that the product temperature has been precisely maintained all right, but as much as five degrees above or below the desired value. Consider such a deviation below the controlled temperature of 161° F. in the short-time pasteurization of milk and one realizes what kind of calamities this type of control can lead into.

Industrial control instruments receive much attention from the accuracy standpoint before they reach you, and the excellent standards adhered to by the industry are the result of a careful and lengthy factory calibration. In general, most control instruments of the thermometer type are calibrated to an accuracy of within plus or minus 1% of total span. This means that the instrument is guaranteed, in a range of 0 to 150° F., for example, to measure within 1.5 degrees of the set point. Thermocouple actuated potentiometer controllers have a guaranteed accuracy of within plus or minus ¼% of scale span, which means that on a similar range of 0 to 150° F., we can expect accurate measurement to within ⅜ of one degree of the set point. Resistance thermometers are even more precise in their calibrated accuracy and are useful for those applications requiring very careful adherence to a set value.

Continuous food processing usually involves a set value for a variable, at which point control is maintained from day to day. For example, tomato juice is sterilized through a heat exchanger at 260° F., milk passes continuously from a cooler at 40° F., etc. Since most industrial instruments are offered with a guaranteed accuracy which is a certain percentage of scale span, it will be to your advantage to employ as narrow a span as possible which will adequately cover the process.

Thermometers and thermocouple-potentiometers are somewhat limited in this respect since they are normally available with minimum spans in the neighborhood of 70 to 80° F. Resistance thermometers, however, can be provided with spans as narrow as 20° F. and therefore are capable of accuracies better than plus or minus a tenth of a degree and have chart divisions as small as ¼ of a degree.

Reproducibility of measurement can be considered accuracy as it exists from day to day. An instrument which measures and registers a true 145° F. one day, a month later may be registering 143° F. while the variable may still be at the 145° level. The tendency of an instrument to reproduce its readings accurately relies mainly on the precision of its construction and the way it is treated in the plant. Thermometer controllers experience an "aging" of their thermal system which can be accelerated by harsh or abnormal atmospheres and which ultimately affects the calibration. Thermocouples may drift in their calibration due to the harmful effects of the medium they are in contact with. Even under the best condition, the periodic checking and maintenance of the controller should be mandatory for obtaining a high degree of reproducibility.

Instrumentation and processing methods have come a long way in the past few years. It is hard to determine which is responsible for which. The demands of process engineers have often resulted in a refinement or development in the instrument which made it suitable for the new process, and conversely the application of a control instrument has many times made a dubious operation feasible. There is little doubt that instrumentation and continuous process methods are well wedded. This happy marriage, exemplified by the countless pieces of process equipment which are furnished complete with controls, has been the result of a very wholehearted cooperation between plant process engineers and instrument application and design engineers. May this energetic combination continue the good work.

News of the Institute

RECOGNITION

Dean Samuel C. Prescott, Professor Emeritus and formerly Dean of Science at Massachusetts Institute of Technology and first President of the national I. F. T., was awarded an honorary degree of Doctor of Science by Lehigh University, Bethlehem, Pa., at its Founders Day Exercises on October 1, 1947. In conferring this honorary degree upon Dean Prescott, President Whitaker of Lehigh University stated "Your achievements in science and administration have properly brought you world renown. We are happy to join with others in recognizing the success which has been yours in these and other fields."

Dr. L. A. Hall, Technical Director of Griffith Laboratories, Inc., received from Tuskegee Institute at its Spring Commencement the degree of Doctor of Science for his distinguished work in food chemistry.

Dr. Maynard Joslyn, of the Food Technology Division, University of California, has received a special medal from the Chinese government for his outstanding contributions in the field of food technology during and immediately after the war.

Our congratulations to these gentlemen! This recognition of their achievements brings honor also to the Institute of Food Technologists.

1948 CONVENTION IN PHILADELPHIA

June is not far away! It is suggested that each of you jot down on your new calendar the dates June 6-10, the dates for the 1948 I. F. T. meetings in Philadelphia, Pa. See that no conflicting arrangements are made that will prevent your going to Philadelphia, because this is to be the best and most important convention we have ever had, and it needs your support and attendance.

COOPERATION, PLEASE!

No information or only scanty information has been received recently for publication in "News of the Institute" from three or four of the Regional Sections. We have reason to believe, however, that these Sections are still carrying on and hope that some of their activities will be chronicled in the next issue of Food Technology. We have been told by a number of members that more personal items concerning individual members should be included in this column. To have such items in greater abundance requires the cooperation of members. Will you send directly to the editor of this section of the journal (Prof. B. E. Proctor, Department of Food Technology, Massachusetts Institute of Technology, Cambridge 39, Mass.) any news items that you feel should be included? It is easy to obviate duplications but difficult to dig out some of these interesting facts about our members from the widely separated sections of the country. Won't you please cooperate in this respect? Remember, we are interested in what is going on with you as well as your friends and associates. We want to include more items, but not even a mind reader could keep track of all the activities of our members. So send your News Editor a postcard whenever you have some news. Do it now! Don't delay!

NEW FIELDS TO CONQUER

Our past national I. F. T. President, Dr. Laurence V. Burton, has recently changed his activities by accepting a position as Executive Secretary of the Packaging Institute, as of November 1. With the energy and ability for which he

is noted, he conducted the annual meeting of the Packaging Institute in New York City on November 18 and 19, which was reported to be a 100 per cent success. We congratulate the Packaging Institute in being able to attract Larry to the key position in this organization, whose President is Mason T. Rogers of our Northeast Section. Some three thousand I. F. T. members extend their best wishes to Larry in his new field of operations.

IN MEMORIAM

Announcement is made of the untimely death, on January 17, 1947, at Belleville, Illinois, of Dr. Philip Anthony Greco, following an attack of pneumonia. Dr. Greco was biochemist in the Loudon Division of Standard Brands, Inc. He is survived by his widow and a three-year old daughter. To them we extend our sincere sympathy.

Edgar "Red" Wilkins, co-owner of Coast Laboratories in Fresno, California, passed away last October after an illness of about a year. "Red" was widely known in food, wine, and mining circles, and his death is deeply regretted. Our sincere sympathy is extended to his family and his associates in the Coast Laboratories.

1947-1948 I. F. T. COMMITTEE CHAIRMEN

Qualifications
E. M. Chace

Budget
Philip K. Bates

Constitution
M. A. Joslyn

Certificate and Emblem
L. V. Burton

Membership
H. E. Goresline

Student Group
C. S. Smith

Education
George F. Stewart

Regional Sections
J. A. Dunn

Public Relations
E. E. Jacobs

Program
Paul Logue

International Congress
F. C. Blanck

Nomination
E. H. Harvey

Regional Section News

CHICAGO SECTION

The Chicago Section is to be commended for its pioneer work in organizing a Speaker's Bureau. This Bureau sponsors talks by I. F. T. members before various civic and technical groups in the Chicago area on subjects related to food technology. The primary objective of this service is to improve the professional status and public relations of food technologists by publicizing popular and scientific aspects of food technology. The Bureau has received enthusiastic response from lay groups and favorable comment from a number of technical societies. During the first ten months of operation, the Bureau filled about fifteen speaking requests.

The Bureau has been organized by the Professional Status and Public Relations Committee of the Chicago Section, under the chairmanship of Albert I. Kegan. This committee released the following publicity;

"Speakers on Food Made Available"

"The Speaker's Bureau of the Chicago Section, Institute of Food Technologists, is now accepting requests for speakers for the 1947-48 season. No charge whatever is made to organizations within the Chicago area. The Bureau has an impressive list of speakers, specially qualified on the popular and scientific aspects of foods. Inquiries should be addressed to the Institute of Food Technologists, 520 North Michigan Avenue, Chicago 11, Illinois, Telephone Whitehall 7900.

"Among the topics available are:

1. The Food We Eat.
2. Facts, Fables, and Foibles about Food.
3. Food Technology as a Profession.
4. Food Technology as applied to any industry specified by the group to be addressed.

"The Institute of Food Technologists is an organization for the advancement of food technology and the maintenance of high professional standing among its members, most of whom are chemists or bacteriologists and all of whom are qualified experts in the field of food technology."

Chicago Section members who have filled speaking engagements for the Bureau are: G. E. Brissey, Dr. L. R. Hedrick, W. Carson Brown, Esther O. Kegan, Dr. Lawrence James, J. J. Harris, Dr. J. R. Wagner, Dr. L. E. Clifcorn, Dr. W. M. Urbain, M. A. Hoy, Charles L. Smith, John Hulen, D. J. Wessel, and Albert I. Kegan.

J. J. Harris, who served as Chairman of the Chicago Section's House Committee during 1947, has been transferred to the Sales Department of the Continental Can Company, at Portland, Oregon.

Dr. Marjorie L. Sutherland, formerly of Libby, McNeill & Libby, has started a consulting practice in quality control under the name of "Specialized Statistical Services."

Lawrence L. Wiseman has joined the staff of Marco Flowmaster, Inc., as food technologist in Chicago.

Dr. O. R. Alexander of the American Can Company presented a paper on "Research in the Canning Industry" at the meeting of the Western New York Section held in Rochester on October 25, 1947.

Donald Thompson has been transferred to Minneapolis by the Continental Can Company.

Grant C. Marburger has moved from the Chicago area to work for Rogers Brothers Food Products, Grand Forks, N. D.

L. V. Taylor, who has been active in the Chicago Section in various capacities including Executive Committeeman, has been transferred to New York where he will have charge of the industrial hygiene program of the American Can Company.

GREAT LAKES SECTION

An especially fine program was enjoyed by members of the Great Lakes Section on November 21, 1947, in Detroit, Michigan, when both afternoon and evening programs were held. The afternoon program was as follows:

"Let's Talk about Food," by Miss Mary T. Barber, Director of Home Economics, Kellogg Company, Battle Creek, Michigan.

"Synthetic Detergents and Quaternary Ammonium Compounds," by Mr. Leslie R. Bacon, Research Department, Wyandotte Chemicals Company, Wyandotte, Michigan.

"Cold Storage for Fruits and Vegetables," by Dr. J. H. L. Truscott, Chief of Horticultural Research, Ontario Agricultural College, Guelph, Ontario.

The evening dinner speaker was Dr. R. W. Pilcher, Associate Director of Research, American Can Company, Maywood, Illinois, who discussed "Some Practical Aspects of Consumer Claims." In his talk Dr. Pilcher traced the laws for liability in the processing of foods from the Thirteenth Century to the present. He showed that the index of claims against manufacturers rises when general economic conditions are below normal and declines when general incomes are high. He reviewed a number of recent court cases and pointed out that the technical man must know all the details about the manufacture of his product.

MARYLAND SECTION

The monthly dinner meetings of the Maryland Section have been resumed at the Hotel Stafford, Baltimore, on the second Friday of each month.

The October meeting was addressed by Dr. J. A. Bouton of the S. B. Penick Company, who talked on "Natural and Synthetic Flavors for Food Products."

In November, Mr. MacAdam of Blumenthal Brothers gave an address on "Chocolate and Chocolate Products."

The Maryland Section is cooperating with the Graduate School of the Department of Agriculture in Washington, with the object of presenting a series of discussions by food technologists on practical technological problems in various phases of the food industry.

At the Annual Meeting held on December 12, 1947, the following officers were elected for 1948:

Chairman—Mr. S. W. Arenson, Doughnut Corporation of America, Ellicott City, Maryland.

Vice-Chairman—Mr. F. A. Feild, Federal Yeast Corporation, Colgate Creek, Maryland.

Secretary—Mr. M. Siegel, Strasburger & Siegel, 15 South Gay Street, Baltimore, Maryland.

Treasurer—Dr. H. B. Siegmund, Hendler Ice Cream Co., Baltimore, Maryland.

The speaker at the meeting was Dr. R. F. Cohee of the Corn Products Refining Company, who presented a paper on the manufacture of corn products and their uses in food technology.

NORTHERN CALIFORNIA SECTION

The annual business meeting and Ladies Night are scheduled for December 4, 1947, at which time officers for the coming year will be elected. The tentative program for the afternoon session will include the following:

"Chemical Estimation of Odor Intensity," by Dr. Lionel Farber.

"Protective Effect of Sugar on Ascorbic Acid," by Dr. M. A. Josyln and Helen Supplee.

"Spanish Sherry Experiments," by Dr. W. V. Cruess.

"Possible Practical Applications of Histological Research to Food Processing," by Dr. Leonora A. Hohl.

The evening speaker at this annual meeting will be Dr. Stanley Freeborn, Assistant Dean, College of Agriculture, University of California. His subject will be "The Aims of Agricultural Research."

The Annual Food Processors Conference, sponsored by the Food Technology Division of the University of California, will be held on the Berkeley campus on January 5 and 6, 1948. The conference will be devoted chiefly to subjects of interest to food packers and suppliers.

An abstract of the talk on "Quaternary Ammonium Compounds" delivered at the August 1947 meeting by Dr. Otto Rahn has appeared in the October 1947 issue of "The I. F. T. Hornblower."

The Northern California Section had 318 members as of October 15, 1947, thanks to the efforts of Sherman Leonard, Chairman of the Membership Committee, and his associates.

The Employment Committee has been successful in securing positions for available applicants. Positions open are listed in The Hornblower. Communications regarding positions should be addressed to Employment Council, Institute of Food Technologists, 2545 Sixteenth St., San Francisco.

Six I. F. T. members are presenting papers at the Pacific Chemical Exposition.

The annual dues of the Northern California Section are to continue at the 1947 level of $2 per member. During 1947 this Section spent about $1.83 per member, of which $0.86 represented the cost of publishing *The Hornblower* above revenues earned by the paper. The Section is to be congratulated on its sound financial condition, its total bank balance at the end of 1947 being about $100 above what it was at the first of the year.

The following applications for membership were approved: Helge Shipstead, Paul Mariani, Jr., George W. Harnick, Henry Stoner, Phillip J. Brady, Dr. Joseph Deck, J. A. Skogstrom, Dr. E. L. Jack, Jethro Jagtiani, James A. Parsons, Prof. Edward Ross, T. N. Lindquist, John W. Thomson, Jr., Edward Ray, Paul M. Hunt, Walter D. Purton, Anthony Jacklevich, and Leslie C. Weymouth.

Secretary Ernest E. Jacobs has been appointed to two national I. F. T. committees, one for the design of an I. F. T. emblem and one on I. F. T. public relations.

Byron Leslie has left Hunt Brothers and joined Milt Waggenheim's canning and freezing operations in the Northwest.

During the summer of 1947, W. V. Cruess toured the High Sierras.

M. S. Dunn and Louis B. Rockland, of the University of Southern California, gave courses at the summer session of the University of California.

Vernon K. Watson, formerly of Reynolds Research Corporation and the QMC Laboratory in Chicago, has been appointed Assistant Chemist in the Division of Chemistry at Washington State College.

At the joint October meeting of the Northern and Southern California Sections, Dr. T. L. Swenson gave a talk on "The Importance of Chemicals in the Food Processing Industries" before the Western Chemical Market Research Group.

Tom Mansfield and Frank Hickey, of the Food Machinery Corporation, returned to California in the late fall of 1947 after a three months' tour of development work in vegetable processing.

Max Bartholomew has opened his own office as a wine broker in Fresno. Formerly he held the position of grape buyer for a large winery.

Roy Mineau, chemist for Cresta Blanca Wine Co., has returned to Livermore after several months of temporary duty at the Roma plant in Fresno.

Norman Braskat has returned from Detroit and is now with the Gallo Wine Company in Modesto.

Tom Scott, formerly with the Monarch Wine Company in Fowler, has been in charge of the new Giumarra Vineyards Company Winery at Edison.

Emil Mrak had a trip to Washington in November, where he met with the Food Container Associates.

Dr. Michael Copley, Director of the U. S. D. A. Western Regional Research Laboratory in Albany, New York, has announced that the laboratory has been reorganized along commodity rather than functional lines.

NORTHEAST SECTION

Our genial Secretary, Joe Austin, has left the Dewey & Almy Chemical Company to set up a business of his own, which will specialize in adhesives and their distribution. We wish Joe success in his new venture.

Robert Gray, who served ably as Chairman of our Publicity Committee for the I. F. T. Convention last June, was in California the first two weeks of December to attend the opening of a new Dewey & Almy chemical plant in San Leandro.

Dr. B. E. Proctor, M. I. T., Cambridge, has been invited to give a series of lectures on food technology in Sweden, Denmark, Norway, and Finland. The invitation has been extended by the Royal Swedish Academy of Engineering Sciences at Stockholm, who have extended a similar invitation to Dr. L. V. Burton.

A meeting of the Northeast Section has been scheduled for December 8, at which time Mr. A. E. Griffin, Assistant Director, Technical Service Division, Wallace & Tiernan Company, Inc., Newark, N. J., will discuss "New Uses of Gases and Chemicals in the Food Industries."

A complete portfolio comprising the summary reports of the several chairmen of the Local Arrangements Committees for the Convention held in Boston last June has been forwarded to Mr. E. Everett Meschter, General Chairman of the 1948 Philadelphia Convention Committee. It is hoped that the information and suggestions in these reports will be of help to the Philadelphia Section in its plans for the next Convention, which is to be held in that city on June 6-10, 1948.

PHILADELPHIA SECTION

The first meeting of the 1947-1948 season of the Philadelphia Section was held on October 9, 1947, at the University of Delaware and was open to members, wives, and guests. The session included a visit to Longwood, a brief tour of the university, dinner at Wolf Hall, and an evening meeting at which Mr. Lee Towson, General Manager of Glen-Mar Farms, Chestertown, Md., spoke on "Prepackaging Fresh Fruits and Vegetables." In his talk Mr. Towson discussed the future trends in the marketing of prepackaged fresh fruits and vegetables and the role that transportation by air may play.

Seminars in food technology, conducted by Dr. Walter A. Maclinn, Chairman of the Department of Food Technology at Rutgers University, are scheduled to be held the first and the third Thursday of each month at the Campbell Soup Company in Camden, N. J. The first seminar was held on October 16, 1947, and the subject discussed was "What is a Food Technologist?" The second meeting was devoted to a discussion of "Flow of Liquids," the third to "Flow of Heat," and the fourth (December 4) to "Flow of Solids."

On November 13, 1947, members of the Section met in Philadelphia to hear Mr. Leroy Strasburger of Strasburger & Siegel, Food Consultants, Baltimore, Md., discuss "What's New in Food Technology."

On January 15, 1948, Dr. Louis Howard, Director of Regional Laboratories, Department of Agriculture, Washington, D. C., will address members of the Section in Philadelphia on "Accomplishments of the Regional Laboratories."

The following members have withdrawn from the Philadelphia Section but have joined other I. F. T. sections during the past few months: Dr. I. J. Hutchings has gone to Pittsburgh, Dr. Robert Buck to Chicago, Dr. Charles C. Walts to Boston, and Dr. James Oyler to Baltimore. Mr. O. F. Roller, Jr., has resigned.

PUGET SOUND SECTION

On October 23, 1947, a meeting of the Puget Sound Section was held at Johnson Hall, University of Washington. Mr. W. L. Haley, in charge of the Fisher Flouring Mills Laboratory, addressed the group on the subject "The Milling Industry Today." Mr. Haley outlined the steps in production of various types of flour including "tempering" of grain, grinding, blending, chemical treatments to age, bleach, break down glutens, and retard enzyme action. Addition of vitamins to flour for the purpose of enrichment was discussed. Mr. Haley mentioned the following problems of the Milling Industry: (1) Simplification of machines and equipment, (2) Protection of grain and flour from insects and rodents, (3) Objective means of determining quality of flour.

Following Mr. Haley's address and the group discussion at the conclusion of the address, a business meeting was held, during which annual dues of $2.00 per year were voted for the Puget Sound Section. These dues are in addition to the National Membership dues of $5.00 per year and were voted to provide working funds for the Section.

A program committee was elected consisting of the following: Clarence Anderson, E. J. Ordal, and Francis Owens.

SOUTHERN CALIFORNIA SECTION

The Proceedings of the June 1947 Conference on "Industrial Waste Disposal and Problems of California Agriculture" have been published in mimeographed form as Volume I, No. I, the object being to disseminate further the information presented at the conference. For a list of the papers presented at this conference, see Food Technology, 1947, Vol. 1, No. 3, News of the Institute, pp. 28-29. Although about 100 copies of these Proceedings were printed, the supply is now nearly exhausted. If members of I. F. T. are interested in securing copies, they are advised to communicate with Mr. Louis B. Rockland, Department of Chemistry, University of California, Los Angeles 24, California.

On September 10, 1947, members of the Southern California Section heard a talk by Mr. Roy M. Hagen, Chairman of the California Consumers Corporation, on "What is Our Food Supply?"

On November 19, 1947, this Section held a meeting in Los Angeles in collaboration with the Flavoring Extracts Manufacturers Association of California. The main speaker of the evening was Mr. A. J. Lorenz, Director of Nutritional Research for the California Fruit Growers Exchange. Mr. Lorenz discussed "The Significance of Natural Food Pigments to Nutrition."

ST. LOUIS SECTION

The two meetings held in the fall of 1947 included (1) a guided tour through the new Ralston Purina Research Building, which houses the Purina laboratories, farm department, and cereal pilot plant, and (2) an interesting lecture by a St. Louis member, Mr. J. Carl Dawson of J. Carl Dawson and Associates, who spoke on "Industrial Sanitation."

On December 5, 1947, a joint meeting was held with the St. Louis Section of the American Association of Cereal Chemists. Dr. R. M. Sandstedt, National President of this Association, spoke on the "Relation of Starch Properties to the Baking Characteristics of Flour."

WESTERN NEW YORK SECTION

The regular autumn meeting of the Western New York Section was held in Rochester, New York, on October 25, 1947. Among those who attended were about thirty students from the Frozen Food Technology School, Alfred University, Alfred, New York. The program included the following:

"Packaging" by Mason T. Rogers.
"Research in the Canning Industry" by O. R. Alexander.
"Practical Application of Enzymes in Food Technology" by W. A. McIntire.
"Vacuum Sealing" by H. C. Scott.
"Sanitation Problems in the Food Industry of New York State" by C. H. Fogg.
"Engineering Problems in the Food Industry" by E. M. McBean.

Following the program of papers, the regular business meeting was held, the main feature of which was the election of officers for the coming year. The following were elected:

Chairman	F. A. Lee
Vice-Chairman	John Fix
Secretary-Treasurer	W. S. Conway, Jr.
Section Councillor	Kenneth Dykstra
Local Councillors	Dominic DeFelice, H. W. Powell

Following dinner, the Reverend Thomas Shortell addressed the group on the subject "The Human Element in Labor Relations."

Our President of the national I. F. T., Dr. George J. Hucker, and his colleagues, Dr. David Hand, Dr. C. S. Pederson, and Dr. Z. I. Kertesz, made a trip to Buffalo and its suburbs recently to visit industries in that area.

Selected Abstracts

ANALYTICAL METHODS

1H. Photometric microdetermination of calcium.

DeLuca, H. A. *Canadian J. Res., 25,* 449-54, Sept. 1947.

A method is described for the photometric determination of amounts of calcium ranging from 0.04 to 0.16 mg. The calcium is precipitated as the oxalate. The latter is converted to the carbonate by heating at 475° to 500° C. for one hour. The carbonate is dissolved in 1 ml. of 0.01N hydrochloric acid. The excess acid is allowed to liberate iodine by reacting with potassium iodate and potassium iodide. The absorption of the iodine solution is measured by use of an Evelyn colorimeter, and the calcium originally present in the sample is determined from calibration data.

2H. Determination of iron in foods and food products.

Pohle, W. D., Cook, J. H., and Mehlenbacher, V. C. *Food Res., 12,* 229-38, May-June 1947.

A simple and accurate method is presented for the determination of iron in food products, such as milk, dried milk, meats, meat products, fats and oils. This method involves dry ashing the sample and determining the iron colorimetrically with 1, 10-phenanthroline. Phosphates and copper in quantities normally present in these products do not interfere with the determination of iron. For routine analysis, dry ashing at 500 to 550° C. proved superior to wet ashing. Tests indicate that Vycor can be used in place of platinum if the ash is not so alkaline that it attacks the Vycor. Analyses are given for milk, dried whole milk, meats, meat products, fats, and oils.

3H. Determination of acetyl number of fats and oils.

Helrich, K., and Rieman, W. *Anal. Chem., 19,* 691, Sept. 1947.

The method of Roberts and Schuette for determining the acetyl number of fats and oils is by far the simplest and soundest in principle. It has been simplified by minor changes in manipulative technique and by allowing greater latitude in the reagent specifications.

4H. Comparison of several types of apparatus devised for the determination of volatile oil in citrus juices.

Curl, A. L. *J. Assoc. Off. Agr. Chem., 30,* 567-75, Aug. 15, 1947.

A good review of current methods is given. A modified form of the McKinnis apparatus is considered most satisfactory, especially when a few drops of wetting agent are used to assist in rinsing the condenser at the end of a run. References are given.

5H. Amperometric determination of dissolved oxygen in orange juice.

Lewis, V. M., and McKenzie, H. A. *Anal. Chem., 19,* 643-646, Sept. 1947.

A rapid method is described for determination of the dissolved oxygen content of orange juice. An amperometric procedure is used, based on the measurement of the diffusion current at an applied potential of —0.4 volt. The method was calibrated with orange juice saturated with a known concentration of oxygen (measured by the manometric Van Slyke apparatus). A table of solubility of oxygen in orange juices containing 6-16% solids at temperatures of 10 to 30° C. is presented. Solids content of the orange juice had a slight effect on the diffusion current; this was considered a viscosity effect. The method has an accuracy of ± 3% to an oxygen concentration of 0.02% and a single determination requires one minute.

6H. A simplified procedure for the determination of barley extract.

Meredith, W. O. S. *Cer. Chem., 24,* 225-9, May 1947.

A determination for barley extract which eliminates ball milling, boiling and centrifuging is described. The results obtained are compared with those for the old procedure and with malt extract values. The modified method is recommended for routine use.

7H. Methods for determination of alpha-amylase. III. Improved starch liquefying method.

Landis, Q., and Redfern, S. *Cer. Chem., 24,* 157-66, May 19, 1947.

There are two general methods available: the measurement of dextrinization time in the presence of excess β-amylase, and the liquefaction procedures. These two methods are not always equivalent, and therefore an improved starch liquefying method is described. The novel features of this method are the use of the Waring Blendor for preparation of standard potato starch-substrate and the use of a modified Ubbelohde viscometer for the measurement of viscosity. The method is calibrated for barley malt α-amylase in Liquefon units, and sensitivity of about 20

times over the two general methods is claimed.

8H. Starches and starch fractions. II. The determination of starch by hydrolysis with hydrochloric acid.

LAMPITT, L. H., FULLER, C. H. F., AND GOLDENBERG, N. *J. Soc. Chem. Ind., 66,* 117, Apr. 1947.

In the hydrolysis of starch to dextrose by hydrochloric acid at 100°, two reactions occur from the commencement of the heating process —(a) a rapid hydrolysis of starch to dextrose, and (b) a much slower decomposition of the dextrose produced. After correction for the dextrose destroyed, it is evident that starch is quantitatively converted to dextrose according to the stoichiometric relationship 90 parts starch = 100 parts Dextrose.

9H. A spot test for the identification of rodent urine on packaged commodities.

BUCKLEY, M. S., AND WHINERY, J. S. *Cer. Chem., 24,* 380, Sept. 1947.

Para-dimethylamino benzaldehyde in ethyl alcohol along with oxalic acid will give a chrome yellow color if urine is present when test solution is brushed on cotton, paper or burlap bag.

10H. Annular thimble for Soxhlet extractor.

SMITH, I. C. P. *Anal. Chem., 19,* 618 (1947).

A small thimble within a larger, the annular space being filled with the material to be extracted, is suggested. The arrangements permit continuous elution of a thin layer of substance such as flour thereby increasing the efficiency of the extraction.

BIOLOGICAL SCIENCES

BIOCHEMISTRY

11H. Recent work on the chemistry and estimation of vitamin A.

GRIDGEMAN, N. T. *Chem. & Ind., 37,* 555-8, Sept. 13, 1947.

A discussion of recent work on synthesis and structural characterization of the vitamin A complex. Some of the allied compounds and their biological activity related to structure and stereoconfiguration are listed.

12H. Recent work on the chemistry and estimation of vitamin A. II.

GRIDGEMAN, N. T. *Chem. & Ind., 38,* 574-6, Sept. 20, 1947.

A discussion of three classical methods for the estimation of vitamin A. Colorimetric methods depending on a chloroform solution of vitamin A and a test solution are discussed. The other two methods are spectrophotometric analysis and a combination of spectrophotometry and destructive irradiation. All three tests can be used to differentiate between vitamin A, and its congeners. The main difficulty is the definition of a standard vitamin A solution.

13H. The acute and chronic toxicity of nordihydroguaiaretic acid.

CRANSTON, E. M. *et al. Federation Proc., 6,* 318-9 (1947); *J. Am. Oil Chem. Soc., 24,* 252, July 1947.

The acute toxicity of nordihydroguaiaretic acid (NDGA) was found to be less than that of phenol and catechol on oral administration to mice, rats and guinea pigs, and intraperitoneally in mice. Orally in guinea pigs and intraperitoneally in mice, NDGA was more toxic than gum guaiac. Orally in mice and rats, both NDGA and gum guaiac were relatively nontoxic.

MICROBIOLOGY

14H. The effect of large amounts of nicotinic acid and nicotinamide on bacterial growth.

KOSER, S. A., AND KASAI, G. J. *J. Bact., 53,* 743-53, June 1947.

Whereas 1000 μg. nicotinic acid or nicotinamide/ml. medium has little effect on rate of growth of a number of bacteria, 3000 and 5000 μg./ml. retard growth more markedly and 10,000 μg. often inhibits it completely. With the presence of casein hydrolysate the inhibition is much less, and with yeast extract it is absent while with crystalline vitamins and related compounds there is inhibition.

15H. Bacteriophage under the ordinary microscope.

HOFER, A. W. *J. Bact., 53,* 781-92, June 1947.

The new phase microscope was used to demonstrate the phage without staining. By means of an acid-fast technique and other stains, the structures were visible under the ordinary microscope. They were observed to lyse cells and thus were proved to be phage.

16H. Production of citric acid in submerged culture.

KAROW, E. O., AND WAKSMAN, S. A. *Ind. Eng. Chem., 39,* 821-5, July 1947.

The submerged culture fermentation method has been applied to the production of citric acid. A strain of Aspergillus wentii has been found to produce citric acid with complete absence of oxalic acid. A definite

balance of minerals in the medium and highly aerobic conditions are necessary. Sucrose, glucose, and cane molasses purified by various means can be utilized for the production of citric acid. Neutralization of a portion of the fermentation acid with calcium carbonate results in higher yields.

17H. Some introspections on mold metabolism.

FOSTER, J. W. *Bact. Revs., 11,* 167-88, Sept. 1947

There are three main types of variation in micro-organisms. One is apparent in the various progeny of a single cell while the other can be observed only under specific conditions since it is a latent variation. Both of these types are genetic variations. The third type, which is discussed most fully in this review, is response variation and involves whole populations rather than single cells. Carbohydrate metabolism is discussed quite fully. A Shunt mechanism is described as explaining why products such as organic acids are left in high sugar concentration media and not when the sugar concentration is low. The high sugar content of the medium disrupts the normal metabolism of the cells so secondary enzyme systems are brought into use producing different fermentation products.

18H. Bacteriological studies relating to thermal processing of canned meats. VII. Effect of substrate upon thermal resistance of spores.

VINTON, C., MARTIN, S., AND GROSS, C. E. *Food Res., 12,* 173-83, May-June 1947.

The effect of substrate upon the thermal resistance of spores formed of it has been demonstrated for P. A. 3679 in meat, organs, mixtures of meats, and for mixtures of meat and organs. The thermal resistance of the spores is less when grown in raw meat or organs and increases when grown in either pasteurized or sterilized meats and organs. The average increase amounts to approximately three times. The effect was shown to be related to the substrate itself through repeated raising and lowering of resistance by transfer from media to media. The substrate is shown to have no effect on the slope of the thermal death time curve for P. A. 3679 or for Clostridium sporogenes (Spray.)

19H. Growth and survival of an experimentally inoculated Staphylococcus aureus in frozen pre-cooked foods.

PHILLIPS, A. W., AND PROCTOR, B. E. *J. Bact., 54,* 49, July 1947.

A variety of commercial precooked meat, poultry, and fish products was examined for their ability to support growth and survival of an enterotoxic strain of Staphylococcus aureus. Samples were inoculated and stored at −18° C. for 9 months. Creamed products such as chicken or ham a la king, or creamed tuna or salmon, are good substitutes. Although there was some reduction in counts, large numbers of Staphylococcus aureus survived 9 months at −18° C.

20H. The vitamin A activity and carotene content of tomato juice.

PUGSLEY, L. I., WILLS, G., AND D'AOUST, T. *Canadian J. Res., Sect. E., 25,* 162-6, Aug. 1947.

Vitamin A activity was determined biologically and carotene content colorimetrically on 14 different commercial brands of tomato juice and on the juice prepared from eight different varieties of tomatoes. The vitamin A activity and the carotene content of the commercial brands were well within the range of the values obtained for the different varieties and a probable correlation was found between the vitamin A activity and the carotene content of the different varieties. The mean value for the vitamin A activity of the commercial brands was 11.6 I. U. per cc. (329 I. U. per ounce) showing that tomato juice may contribute significantly to the dietary vitamin A. The amount of lycopene-like compounds in tomato juice is considerably higher than the carotene compounds and was found to vary between different brands and different varieties. A substance was shown to be present in processed tomato juice that had the properties of α-tocopherol in biological assays for vitamin A activity.

21H. The bacteriology of poultry evisceration.

GUNDERSON, M. F., AND ROSE, K. D. *J. Bact., 54,* 46, July 1947.

Spot plates were used to judge the bacteriological condition of the poultry. It was found that a transient flora of intestinal origin was imposed on the skin surfaces in addition to the normal flora. Using certain precautions and innovations in processing, birds can be eviscerated under factory conditions with a relatively low bacteria count.

22H. Some bacteriological aspects of the commercial production of boned chicken.

ROSE, K. D., AND MILLARD, F. G. *J. Bact., 54,* 47, July 1947.

Cooking of eviscerated chicken prior to boning reduces the count to as low as 73 per gram of meat. Workers' hands and equipment then seeds it with an inoculum which increases to as many as 9 million per gram

during the 2½ hours required to complete the boning operation. Further increases occur during holding prior to freezing. Storage at —14° F. rapidly kills many organisms but 2 to 20% can survive storage for 92 days. Excessive initial contamination results in excessive counts in the stored material.

NUTRITION

23H. Protein utilization by the adult rat: The lysine requirement.

MITCHELL, H. H. *Arch. Biochem., 12,* 293-300 (1947).

The lysine requirement of the growing rat differs from that of the adult rat in that the adult rat may be maintained in nitrogen equilibrium by lysine-deficient protein.

Addition of pure lysine or lysine rich proteins does not improve the protein value of such to the adult rat. Thus, for the sexually inactive adult rodent, lysine may not be required.

24H. A bioassay for proteins and protein digests.

TOMARELLI, R. M., AND BERNHART, F. W. *J. Nutr., 34,* 263-72, Sept. 1947.

The assay is based on the determination under standardized conditions of the amount of fed protein or protein digest nitrogen necessary to maintain a constant weight in adult rats that have been partially depleted of body protein. The daily allowance of ration is proportional to the average surface area of the rats. By plotting body weight change during second week against daily nitrogen intake, it is possible to interpolate the amount of nitrogen necessary to maintain constant weight in a partially depleted animal.

25H. The effects of fat upon the rates of digestion in the human stomach of meals of high protein content.

KILLIAN, J. A., AND KNAPP, M. G. *J. Am. Oil Chem. Soc., 24,* 71-5 (1947).

Meals of broiled lean beef with and without fat were fed to people and their stomach contents analyzed at appropriate intervals. Addition of large amounts of fat did not affect hydrochloric acid or pepsin excretion, gastric emptying time, or the digestibility of either the protein or fat.

26H. Heat treatment and the biological value of soya-bean protein.

DE, S. S., AND GANGULY, J. *Nature, 159,* 341-2 (1947).

Heat treatment increases the biological value of soya-bean protein. This appears to be due to destruction of proteolytic inhibitors or other toxic factors, rather than to a change of protein structure. Results were obtained by feeding young albino rats over a period of 8 weeks.

27H. Inadequacy of diets containing whole-grain cereals supplemented with soybean oil meal for lactation and growth of young rats.

VAN LANDINGHAM, A. H., AND LYON, P. B. *Arch. Biochem., 13,* 475-80, June 1947.

A diet containing whole grain cereals, corn, wheat, oats and soybean oil meal supplemented with alfalfa meal, bone meal, choline hydrochloride, and riboflavin is inadequate for good lactation and growth of young rats. The diet is adequate for lactation if supplemented by 2% dried pigs liver but is not adequate if supplemented by 5% additional alfalfa meal or 5% dried brewer's yeast.

28H. Relation of corn products to the requirement of the rat for dietary nicotinic acid.

SALMON, W. D. *J. Nutr., 33,* 169-75 (1947).

Data presented substantiates growth-stimulating effect of nicotinic acid or tryptophane on rats receiving a high percentage of corn in diet. The hypothesis that corn in some peculiarly specific manner retards growth is not supported.

29H. Amino acids required to supplement linseed protein for chick growth.

KRATZER, F. H., WILLIAMS, D., AND BAKER, E. F. *J. Nutr., 33,* 313-8 (1947).

Lysine is the principal amino acid deficiency in linseed protein.

30H. The biochemical defect underlying the nutritional failure of young rats on diets containing excessive quantities of lactose or galactose.

HANDLER, P. *J. Nutr., 33,* 221-33 (1947).

Weanling rats die within 3 to 17 days when fed a diet containing more than 60% lactose or 40% galactose. A very high galactose concentration appears in the blood along with a lowered glucose level. It is concluded that this carbohydrate disturbance is the prime factor in death of these rats.

31H. Growth and reproduction in rats on synthetic rations.

SPORN, E. M., RUEGAMER, W. R., AND ELVEHJEM, C. A. *Proc. Soc. Expt. Bio. & Med., 65,* 5-9, May 1947.

A purified ration containing 10 crystalline B vitamins was fed to rats to determine the effect on growth and lactation. Growth was rapid and the addition of liver and liver preparations increased the rate of growth and the percentage of young surviving during the lactation period.

32H. Factors influencing food acceptance.

EPPRIGHT, E. S. *J. Am. Diet. Assoc., 23,* 579-87, July 1947.

Food acceptance is a complex reaction influenced by biochemical, physiological, psychological, social, and educational factors. Metabolic conditions play a part. Age, sex, and mental state are factors of importance. People differ greatly in their sensory response to foods. The food likes and dislikes of the individual move in a framework of race, tradition, economic status, and environmental conditions. History reveals that changing food habits is usually a slow process. A study of methods which have been employed suggests the value of group feeding as a tool for the improvement of food habits. Educational procedures will gain in effectiveness as they are geared more directly to the needs of the individual or of the specific community, and as they conform more closely to democratic techniques. In efforts to change food habits consideration must be given possible unknown factors in the existing diet and the effect of the change on the intake of other foods.

PHYSIOLOGY

33H. Physiological availability of iodine in dithymol diiodide.

BALDWIN, R. R., THIESSEN, R., AND MCINROY, E. E. *Sci., 106,* 317-8, Oct. 3, 1947.

Radioautographs have been obtained by using radio-active iodine to show that iodine in the water insoluble dithymol diiodide is physiologically available to the thyroid of the albino rat. The insolubility of this compound and the fact that its iodine is physiologically available make it an ideal compound for iodizing salt blocks for cattle.

34H. Caffein as a sleeping draught.

NYMAN, E. *Spice Mill, 70,* 19, Aug. 1947.

Caffein in the case of older people with arteriosclerotic blood vessels of brain and heart acts not infrequently as an excellent soporific. Results have confirmed these observations, and in the medical clinic of the Caroline Hospital there is at present available extensive material on this subject.

FOOD PRODUCTS

BAKING AND BAKERY PRODUCTS

35H. Effect of polyoxyethylene stearate on the crumb softness of bread.

FAVOR, H. H., AND JOHNSTON, N. F. *Cer. Chem., 24,* 346-55, Sept. 1947.

Polyoxyethylene stearate was found to have a pronounced retarding effect on the development of firmness of bread crumb with age. Additions to starch pastes increase the apparent temperature of gelation, but did not prevent complete gelation.

36H. Comparative biological availabilities of various forms of iron in enriched bread.

BLUMBERG, H., AND ARNOLD, A. *Cer. Chem., 24,* 303-14, Sept. 1947.

The biological availabilities of the various forms of iron were rated approximately as follows with reference to the highly available ferrous sulfate as 100%: ferrous sulfate, 100%; reduced iron, 83; ferric orthophosphate, 38; and sodium iron pyrophosphate, 21. These comparisons were made on the basis of hemoglobin regeneration in anemic rats.

CEREALS AND GRAINS

37H. Investigation of the gums found in rye grain.

KRETOVICH, V. L., AND PETROVA, I. S. *Biokhimiya 12,* 97-104 (1947); *Chem. Abst., 41,* 4861h, Aug. 10, 1947.

The gums extracted from rye grain give solutions of extraordinary high viscosities, much higher than are given by starch, egg albumin or gelatin. The viscosity of the gum aqueous solution is independent of the pH but is decreased on the addition of cysteine.

38H. Infrared treatment of cereal germs.

NAEHER, P., AND WILLIAMS, M. T. Assignors to B. F. Gump Co., 2,428,090 Sept. 30, 1947.

The method of treating germs in a flour milling system which includes separating and removing the germs from the grains, subjecting the separated germs or germ middlings in an open chamber to infrared radiation sufficient to heat the germs under such conditions and for a sufficient period of time to remove substantially all of the moisture from the germs and to alter them to a friable condition without substantially altering the vitamin or mineral components, and thereafter returning the dried germs to the grain material passing through the milling system.

39H. Basic principles in drying corn and grain sorghum.

HUKILL, W. V. *Agr. Engin., 28,* 335-8, 340, Aug. 1947.

Enumerates factors affecting drying rate, suggests method by which they may be combined in computations of approximate drying time and reports results of a few tests with ear corn and grain sorghum.

COCOA PRODUCTS

40H. Organic acids in cocoa beans.

MOSIMANN, G. *Mitt. Geb. Lebensmittel. Hyg., 35,* 241-72 (1944); *Nutr. Abst. Revs., 16,* 794, No. 3971, Apr. 1947.

The methods for the estimation of the volatile and non-volatile organic acids in cocoa beans were examined. No non-volatile acid, either free or as a metallic salt, other than oxalic acid and citric acid, was found. Data for the percentages of these two acids and of the volatile acids, as acetic acid, are given for cocoa beans from 8 different sources. Attention is also drawn to the presence of two tannin-like materials easily capable of being split by acid hydrolysis.

41H. Process of treating cocoa beans.

JONES, W. T., AND ZENLEA, B. J. Assignors to Rockwood & Co., 2,428,802, Oct. 14, 1947.

The process of treating cocoa beans which comprises moistening the raw beans, delivering the moistened beans to a current of hot gases in a heating zone and utilizing the current of hot gases to convey the beans through the zone and to simultaneously heat the beans to expand and puff the shells in relation to the shell-enclosed nibs and to at least partially roast the nibs while they are being conveyed through the zone by the current of hot gases.

42H. Process of treating chocolate liquor.

JONES, W. T. Assignor to Rockwood & Co. 2,426,616, Sept. 2, 1947.

Method of treating chocolate liquor containing gritty material, comprising centrifuging the chocolate liquor in liquid form, and continuously removing from the centrifuge, during the centrifugal operation, separate constituent volumes of liquids containing different predetermined proportions, respectively, of cocoa-butter.

43H. Manufacture of chocolate articles.

LEVANGIE, B. M., AND MASS, R. (Assigned to General Foods Corp.) 2,425,431, Aug. 12, 1947.

The method of making chocolate articles having a plurality of superposed distinct layers of chocolate united integrally over substantially their entire areas which comprise tempering the melted chocolate for the layers, depositing the tempered chocolate for a supporting layer in a mold, partially cooling the chocolate in the mold until 10-40% of its fat content is crystallized to form a substantially non-fluid mass capable of supporting a superposed layer substantially without mixing of the layers, then depositing a superposed layer of tempered, chocolate on the supporting layer in the mold, and then cooling the mass to cause crystallization and solidification throughout both layers with the fat crystals of the layers forming a continuous crystalline structure whereby the layers are integrally united.

44H. Process of obtaining theobromine and other products from cocoa materials.

ZENLEA, B. J. 2,422,874 June 24, 1947.

A process of treating theobromine containing material for obtaining theobromine therefrom, comprising passing the material continuously through a heating zone, heating the material while it is passing through the zone at a temperature of about 550 to 800° F. for a time sufficient to break up the complexes in the material and to vaporize the theobromine therefrom, with incidental liberation of other vapors and gases, continuously removing theobromine and other vapors from the zone to a condenser to form a distillate from the vapors, and treating the distillate to remove the theobromine therefrom.

DEHYDRATED FOODS

45H. Prove value of refrigerated storage for dried fruits.

PENTZER, W. T. *Canner, 105,* 13-14, Aug. 2, 1947.

Storage of dried fruits at approximately 32° F. with 40° F., as an approximate upper limit, and also at low humidity, is of sufficient value to the dried fruit industry generally to justify such storage as standard year-round practice. Low temperature storage controls browning, particularly for dried apricots and peaches, for apples, pears and nectarines, and even for whole fruits such as prunes and figs.

46H. The effect of variety and source on the quality of dehydrated potatoes.

BARNELL, H. R., AND GREENHAM, D. W. P. *Chem. & Ind., 23,* 315-8, June 7, 1947.

The suitability of 14 varieties of British potatoes for manufacturing dehydrated potato strips is discussed. The tendency to blacken when reconstituted was not dependent on processing conditions but on the strain used and the nature of the soil on

which it was grown. King Edward variety grown on siltland was judged the most satisfactory for dehydration.

47H. Addition of ground egg shell to dried egg for use in cooking.

DAWSON, E. H., DUEHRING, M. AND PARKS, V. E. *Food Res., 12,* 288-97, July-Aug. 1947.

Scrambled egg, baked custard, ice cream, foundation cake, muffins, yeast rolls, popovers, and mayonnaise were prepared for a study of the utilization of dried egg fortified with calcium from ground egg shell. Samples of each product made with and without the addition to the dried egg of 0.4% ground egg shell were compared by sensory, physical, and chemical criteria. It was found that the addition of ground egg shell in the concentration used did not affect the palatability or cooking quality of dried egg in most food products, provided the shell was ground finely enough to pass through a U. S. No. 400 sieve with openings of 0.0015 in. Ground egg shell decreased the thickness of mayonnaise and increased the volume of popovers.

48H. Preparing dried egg products.

HOPKINS, E. W., JOSH, G., AND HARRIMAN, L. A. Assignors to Armour and Co. 2,427,726, Sept. 23, 1947.

A process for preparing dried egg products comprising inoculating a mixture of egg yolks and whites with a culture of organisms which feed upon reducing sugars, fermenting the inoculated mixture, and drying the fermented mixture.

49H. Composition and method.

MELNICK, D. Assignor to Continental Foods, Inc. 2,426,634, Sept. 2, 1947.

A food concentrate composition comprising a carbohydrate and an amino acid material which can react therewith to form dark pigment, with sufficient acid to maintain the composition at a pH less than 4.5, and an alkaline edible substance in proportion sufficient to react with the acid to give a palatable product of a pH substantially above 4.5, and an edible coating which segregates the alkaline substance from the other components under storage conditions and which disintegrates in boiling water, whereby such formation of dark pigment is inhibited without destroying the palatable quality of the edible product thus prepared from the composition.

50H. Desiccating method and apparatus.

TOOBY, G. 2,422,706, June 24, 1947.

Apparatus for spray drying whole milk, comprising a vertically disposed conical chamber having its vertex at the bottom, a wide shallow duct mounted in an upper portion in the chamber and disposed tangentially thereto for introducing a rapidly moving current of hot air, an air outlet centrally located at the top of the chamber, a spray nozzle for incoming milk to be dried located near the top of the chamber and disposed intermediate the center of the chamber and the inside junction of the air inlet and the conical chamber, nozzle being directed so as to spray milk against the inside edge of the rapidly moving current of hot air, whereby milk sprayed into the air stream will travel toward the periphery of the chamber and across the incoming air stream, and an outlet for the dried milk particles at the bottom of the chamber.

FATS AND OILS

51H. Flavor stability of soybean oil. I. The role of the non-saponifiable fraction.

MATTIL, K. F. *J. Am. Oil Chem. Soc., 24,* 243-6, July 1947.

It has been found that the addition of the non-saponifiable extract of hydrogenated soybean oil to either refined cottonseed oil or refined peanut oil caused these oils to develop odors and flavors characteristic of reverted soybean oil. The non-saponifiable material from linseed oil did not produce a similar effect. When the non-saponifiable extract of hydrogenated soybean oil was added to mineral oil, a sweet syrupy odor and flavor developed. By selective absorbents it was possible to produce a much greater improvement in hydrogenated than in unhydrogenated soybean oil. These observations are discussed in terms of their relationship to the various theories on the mechanism of reversion.

52H. The flavor problem of soybean oil. I. A test of the water washing-citric acid refining technique.

DUTTON, H. J., MOSER, H. A., AND COWAN, J. C. *J. Am. Oil Chem. Soc., 24,* 261-4, Aug. 1947.

Raw soybean oil has been treated on a laboratory scale by a German process including thorough washing to remove gums and addition of 0.01% citric acid during deodorization. A significant improvement in flavor stability resulted.

53H. The flavor problem of soybean oil. II. Organoleptic evaluation.

MOSER, H. A. *et al. J. Am. Oil Chem. Soc., 24,* 291-6, Sept. 1947.

Methods are described for the organoleptic evaluation of oils. Statistics are used to

evaluate the panel for reproducible decisions as well as for their ability to discern small differences. Equations are given for the determination of "significant" and "highly significant" differences.

54H. The mechanism of the oxidant effects of commercial salt and water in butterfat.

HILLS, G. L., AND CONOCHIE, J. *Austral. Council Sci. & Indus. Res. Jour., 19,* 414-29 (1946); *J. Dairy Sci., 30,* A124, Sept. 1947.

The oxidation of butterfat in cold storage is catalysed by water and salt. Dispersed water alone accelerated oxidation. Acceleration of fat oxidation by salt was found to be due to combined effects of halide and hydrogen ions.

55H. Antioxidant properties of the fatty alcohol esters of gallic acid.

MORRIS, S. G. *et al. J. Assoc. Off. Agr. Chem., 24,* 309-11, Sept. 1947.

The antioxidant properties of octyl, dodecyl, tetradecyl, hexadecyl and octadecyl gallates were determined in lard substrate and found to be as effective as nordihydroguaiaretic and gallic acid. The carry-over of the antioxidant properties into baked goods was determined by storage tests on piecrust at 38° and 63° C. and found to be superior to gallic acid and propyl gallate. These esters have the advantage, being more fat soluble than either the acid or lower esters and are more suitable antioxidants for commercial fats.

56H. The use of antioxidants in edible fats and oils.

LUNDBERG, W. O. *Hormel Inst. Ann. Report,* 33-9, 1945-6; *J. Am. Oil Chem. Soc., 24,* 252, July 1947.

Rancidity may develop in fats containing antioxidants before the antioxidant has been destroyed, particularly at higher concentrations. This is true of catechol even at 0.02% concentration. All the antioxidants studied catalyze peroxide formation at the higher concentrations. Although all the antioxidants are approximately equal in the duration of their effects at 0.02% concentration, with NDGA being destroyed in the shortest time, there are major differences at higher concentrations, catechol and hydroquinone being particularly durable at 0.5% concentration. NDGA, on the other hand, is the most lasting and effective of these antioxidants at 0.01% concentration, as has been shown previously. Gallic acid exhibits a peculiarity in its deterioration curve in that the curve is S-shaped. This is apparently due to the synergistic effect that the gallic acid exerts upon itself. As the gallic acid is gradually destroyed, its synergistic effect decreases, thus contributing to an even more rapid destruction of the remaining gallic acid. In the case of combinations of NDGA with citric acid and with methionine, the NDGA deterioration curves are not only prolonged but are somewhat different in shape from those obtained with 0.02% of NDGA alone. This is attributable to the gradual destruction of the citric acid and the methionine. Citric acid was found to have no detectable deleterious effect upon NDGA in lard at 375° F. in the presence of N_2.

57H. A laboratory method for determining the ability of antioxidants to stabilize fat in baked goods.

MATTIL, K. F., AND BLACK, H. C. *J. Am. Oil Chem. Soc., 24,* 325-7, Oct. 1947.

Verification is offered for the hypothesis that the ability of an antioxidant to stabilize fat in baked goods is a function of its solubility characteristics, i.e., it should be more soluble in fat than in water. On the basis of the observation, a laboratory method involving the partition of antioxidants between equal amounts of fat and water was developed where the concentration of the antioxidant is determined spectrographically. A good correlation was found between the laboratory test and actual bakeshop results.

58H. Mono- and diglycerides in industrial fats.

SCHLENKER, E., AND GNAEDINGER, J. *J. Am. Oil Chem. Soc., 24,* 239-40, Aug. 1947.

The saponification value of an industrial fat is not a satisfactory index of the amount of free fatty acid obtainable by distillation, or of the nature of the glycerides present. Experiments on palm oil under conditions suitable for the esterification of mono- and diglycerides with fatty acids to form triglycerides indicate the presence of these mono- and diglycerides.

FROZEN FOOD

59H. Quick freezing of foods.

BAER, J. M. (Assignor to The Guardite Corporation.) 2,425,714, Aug. 19, 1947.

A method of freezing a moisture-containing food product which comprises blanching the product by removing air therefrom and substituting an atmosphere of steam at a temperature in excess of 165° F., and evacuating the food product to reduce its temperature to a point just above the freezing point of water in the product, the step which comprises passing the product, in outspread form and

out of contact with a refrigerating surface, through a chamber having black walls cooled to a temperature of approximately —200° F. wherein the heat of the product is radiated in substantial quantities to the walls and the product is quick-frozen in the chamber, the entire method being conducted in the substantial absence of air and the freezing chamber being continuously evacuated at a pressure below the vapor pressure of water at the temperature of the cooling walls.

60H. UHF heating of frozen foods.

MORSE, P. W., AND REVERCOMB, H. E. *Electronics 20*, 85-9, Oct. 1947.

Problems encountered in developing 1050 M. C. continuous-wave magentron oscillator equipment for thawing and heating precooked frozen food are discussed. Operating at a frequency comparable to the newly allocated 915 M. C. band for electronic heating, the unit makes a vegetable, potato, and meat too hot to eat in 70 sec. Investigation using the U. H. F. band was conducted primarily because arching between food masses occurred at frequencies of 40 M. C. and below. The high voltage gradient necessary for the heating of foods at lower frequencies rendered them impractical. Penetration difficulties are apparent as soon as a frequency of much over 1,000 M. C. is exceeded.

61H. Are frozen foods a public health problem?

FITZGERALD, G. A. *Am. J. Public Health, 37*, 695-701, June 1947.

Although frozen foods have been free from suspicion of being health hazards both as to enterotoxic food poisoning and infectious diseases, research along these lines should be undertaken by the industry since laboratory methods for detecting such organisms are presently inadequate. There is a possibility that pathogenic organisms may survive the freezing-storage treatment and cause infectious diseases, especially if the foods are to be used uncooked.

62H. Strawberry studies. A new method for determining firmness.

KALOYEREAS, S. *Fruit Prod. J., 27*, 6-7, Sept. 1947.

Rapid freezing of strawberries results in increased firmness and decreased drip in the thawed product. The addition of ascorbic acid, glutathione or pectin-calcium chloride had only slight effect upon the quality of frozen strawberries and strawberry juice. A new apparatus is described for the determination of firmness of strawberries, and it can also be used for measuring and obtaining drip.

63H. Discoloration in the bones of frozen poultry.

Refrig. Res. Foundation, Bul. 47-6, 2, June 20, 1947.

Discoloration in the bones of frozen poultry is due to the breakdown of marrow cells by freezing and is especially common with young birds with more active blood manufacturing tissue. Thorough and rapid bleeding, cooler scalding temperatures and quick handling reduce discoloration during subsequent frozen storage.

64H. Process of freezing comestibles.

WELLING, C. H. 2,424,870, assigned to Z Pack Corporation, Boston, Mass. July 29, 1947.

A multi-step method of quick freezing comestible units in a loose, free-flowing mass, which consists in passing a liquid refrigerant of low viscosity containing sugar over and in direct contact with the unfrozen units, thereby coating each unit with a protective low-vapor-pressure film consisting of a gel-like layer composed of the sugar-containing refrigerant and the juices and pectins of the comestible and preventing appreciable osmosis from the units; continuing the refrigerant contact with the units over a period of time and at a temperature approximating 13 to 18° F., thereby rapidly quick-freezing hard protective outer shells in the units beneath the film, and thereafter completing the quick freezing of the units by contacting them with a refrigerant at a lower temperature which solidifies the units throughout their mass.

65H. Ice cream manufacturing process and product thereof.

LANDERS, M. 2,423,600, July 8, 1947.

A composition for improving the texture of ice cream comprising a water-soluble salt of carboxymethylcellulose and a mixed glycerol diester of a higher fatty acid and an aromatic carboxylic acid.

66H. Method of manufacturing ice cream and product thereof.

NELSON, B. 2,423,613, July 8, 1947.

The method of making an improved ice cream which comprises incorporating a mixed glycerol diester of a higher fatty acid and in an aromatic carboxylic acid in the unfrozen ice cream mix and thereafter subjecting the mix to freezing conditions.

FRUIT AND FRUIT JUICES

67H. The effects of degree of concentration and of temperature of storage.

CURL, A. L. *Canner, 105,* 14-16, Sept. 20, 1947.

Storage studies were carried out on six packs of concentrated juice and one pack of single-strength juice. The results demonstrate the desirability of storing concentrated orange juice at 60° F. or below. The need for low-temperature storage increases with the degree of concentration.

68H. The origin of the off-flavor which develops in processed orange juice.

CURL, A. L., AND VELDHUIS, M. K. *Fruit Prod. J., 26,* 329-30, July 1947.

A study of 18 experimental packs of orange juice in glass containers was made in order to obtain more information on the origin of the off-flavor which develops on storage at room temperature. The fraction responsible for the major part of the off-flavor was found to be the suspended material, which includes the lipid or fatty fraction. Filtered juices developed some off-flavor on storage at 80° F., but was much less than in whole juices and quite different in character. Peel oil was not responsible for much, if any, of the off-flavor; in some cases it appeared to mask the off-flavor instead. Reconstituted orange juice concentrates and a juice pressed from peeled fruit developed about as much off-flavor as juice from unpeeled fruit. The water-soluble ester or essence fraction had little or no effect on the development of the off-flavor.

69H. Storage temperature prime factor in controlling apple juice flavor.

EASTERN REGIONAL RES. LAB. *Canner 105,* 10, Oct. 25, 1947.

A survey of apple juice packed in 1946 has just been completed. The results of the survey indicate a trend away from deaeration and towards the use of ascorbic acid and the centrifuge. In addition, no apparent relationship was found between the flavor score in June and the variety of apples used, treatment before pasteurization, the type of container, deaeration, the use of ascorbic acid, filtration, whether the juice was clear or cloudy, or the size of the processing plant. Juices with a Brix above 13° were usually better flavored than those below.

70H. Comparison of the essences from nine varieties of apples.

GRIFFIN, E. L., TALLEY, F. B., AND HELLER, M. E. *Fruit Prod. J., 27,* 4-5, Sept. 1947.

Essences from nine varieties of apples were prepared and incorporated into candy, jelly, and reconstituted juice for comparison. The aroma of each essence is characteristic of the variety of apple from which it is produced. Blends are likely to make more successful essence than the juice of single varieties. In none of the three products was any single variety as good as the standard blend of Stayman and McIntosh. Apple candy of the gum type is a promising new confection, made possible by apple essence. Apple jelly made with added essence is much fruitier in flavor than that made without it.

MEAT AND SEA FOOD

71H. Effect of cooking and curing on lysine content of pork luncheon meat.

WILDER, O. H. M., AND KRAYBILL, H. R. *J. Nutr., 33,* 235-42, Feb. 1947.

There is approximately a 12% loss of lysine in pork luncheon meat during curing, but there is no appreciable loss during cooking.

72H. Shrimp peeler.

LAPEYRE, F. S., AND LAPEYRE, J. M. 2,429,828, Oct. 28, 1947.

A shrimp peeling machine comprising a pair of rollers so positioned relatively to one another as to provide and crotch for receiving raw shrimp, means whereby the rollers are oscillated in reversed directions to pinch the peels through and beyond the crotch, and means whereby a jet of water at high velocity is directed against the under portions of the rollers to carry off the removed peels.

MILK AND DAIRY PRODUCTS

73H. Method and apparatus for deaerating liquid foods.

SHARP, P. F., HAND, D. B., AND GUTHRIE, E. S. Assignors to Cornell Research Foundation. 2,428,044, Sept. 30, 1947.

A once-through process for treating milk to preserve its vitamin C content, to remove dissolved oxygen, and to retard the development of an off-flavor therein, comprising continuously delivering the milk into a deaerating chamber as a finely divided spray and at a temperature of about 105° to 115° F., maintaining sufficient vacuum in the chamber to evaporate an amount of water equal to about ½ to 2% of the weight of the milk and reduce the temperature about 7° to 15° F., continuously removing the oxygen and water vapor from the chamber as rapidly as liberated, and continuously removing the deoxygenated milk from the chamber at a point substantially below the liquid surface level therein and at substantially the rate at which

it is being sprayed to maintain a substantially constant liquid level of milk in the chamber under vacuum.

74H. Some effects of feeding iodinated casein to dairy cows.

BOOTH, A. N., ELVEHJEM, C. A., AND HART, E. B. *J. Dairy Sci., 30,* 443-55, July 1947.

The indiscriminate use of iodinated casein may lead to a negative rather than a positive over-all gain from a practical view point. Milk yield is increased temporarily after which it falls to a lower yield than before the iodinated casein feeding. Considerable caution should be exercised until more work is done.

PECTIN—JAMS AND JELLIES

75H. Pectin studies. I. Method of purification.

LAMPITT, L. H. *et al. J. Soc. Chem. Ind., 66,* 121-4, Apr. 1947.

Comparative tests were carried out on the purification of crude pectin extracts by (a) dialysis, (b) precipitation by alcohol, and (c) ionic exchange. The results showed that dialysis followed by precipitation gave the highest calcium pectate value and complete removal of sugars, free acids and free ash. Ionic exchange gave a pectin of considerably lower residual ash content, but the additional reduction was at the expense of the inorganic ions combined with the pectin and is thus of doubtful desirability, except for particular purposes.

76H. Pectin studies. II. The effect of dry grinding.

LAMPITT, L. H. *et al. J. Soc. Chem. Ind., 66,* 157-60, May, 1947.

The dry grinding of pectins in a ball mill caused depolymerization of the pectin molecules. The depolymerization was accompanied by a loss of gelling power. The calcium pectate and saponification values were not changed significantly by grinding.

77H. Recent advances in the chemistry of pectic substances.

JOSLYN, M. A., AND PHAFF, H. J. *Wallerstein Lab., 10,* 39-56, Apr. 1947.

A review of the available literature on pectin up to Oct. 1, 1946 with 170 references. Subjects covered are: Occurrence of pectic substances, extraction and isolation of pectic substances, chemical constitution of pectic substances, chemistry of galacturonic acid, physico-chemical properties of pectins, pectin-acid sugar jellies, low methoxyl pectin gels, and analytical methods.

78H. Advances in pectin chemistry. I.

SPEISER, R. *J. Polymer Sci., 11,* 281-9, June 1947.

The first part of a review on some recent advances in pectin chemistry. Part I reviews recent work on the constitution and structure of pectin, the characterization of pectin, x-ray diffraction studies on sodium pectate, and the acid dissociation of pectinic acids.

79H. An improved method for measurement of gel strength and data on starch gels.

HAMER, W. J. *J Res., 39,* 29-37, July 1947.

A method is described for the measurement of gel strength that involves essentially the determination of the shearing force required to fracture gels. Standardization of the method is outlined and applications are given to illustrate the precision of the method and its use in studies of starches of various kinds.

80H. Method of preparing pectin.

LEO, H. T., AND TAYLOR, C. C. 2,425,947, Aug. 19, 1947.

A method of isolating pectin from an aqueous solution thereof which comprises coprecipitating aluminum hydroxide and pectin, the improvement which comprises effecting the coprecipitation by the addition of calcium carbonate and of aluminum chloride, and boiling the resultant mixture of coprecipitate and mother liquor.

81H. Irish moss food product.

FRIEDEN, A., AND WERBIN, S. J. Assignors to Stein Hall & Co. 2,427,594, Sept. 16, 1947.

A material for improving the gelling or thickening properties of a food product, consisting of a complex of Irish moss and a salt chosen from the group which consists of the edible potassium and ammonium salts.

POULTRY AND EGGS

82H. The arginine requirement of young turkey poults.

KRATZER, F. H. *et al. J. Nutr., 34,* 167-71, Aug. 1947.

Approximately 1.35% arginine is required in the total ration to produce optimum growth in the turkey poult.

83H. The comparative pyridoxine requirements of chicks and turkey poults.

KRATZER, F. H. *et al. Poultry Sci., 26,* 453-6, Sept. 1947.

Chicks and turkey poults were fed similar diets containing various levels of pyridoxine. On the low levels of pyridoxine in the basal

diet used in these tests the poults were unable to utilize their feed efficiently and most of them (7 to 9 out of 10) died during the three weeks' test period. Chicks and poults required 200 and 300 γ of pyridoxine per 100 g. of feed respectively for optimum rate of growth.

84H. Poultry plucking machine.

JOHNSON, G. W. Assignor to Gordon Johnson Co. 2,429,628, Oct. 28, 1947.

In a poultry plucking machine, a rotatably mounted shaft having a pair of spaced apart axially disposed discs, elongated elastic members secured between said discs in substantially parallel relation to said shaft, and feather engaging fingers disposed in pairs with the pairs spaced apart along each of the elastic members.

85H. Plant sanitation.

GUNDERSON, M. F. *U. S. Egg Poultry Mag., 53,* 7, July 1947.

Relatively few cases of food poisoning have been traced to poultry and eggs. However, several outbreaks, probably caused by Salmonellas, or the organism Clostridium perfrengins, have been reported. These cases emphasize the importance of producing a finished product that is low in organisms coming from the intestinal tracts of chickens and turkeys.

86H. Process for preserving eggs for edible consumption.

FUNK, E. M. 2,423,233, July 1, 1947.

A process for preservation of shell eggs, comprising subjecting eggs to a fluid at an elevated temperature, the temperature being within a range of about 110°-140° F. and about the time of treatment being restricted to a period of about five to about forty minutes, so that pasteurization is substantially accomplished while the edible and whipping qualities are retained for a period several times as long as an untreated fresh shell egg, the albumen is preserved in thick but perceptibly unclouded condition and any potential embryonic development is arrested.

SALT

87H. Iodine and table salt.

J. Am. Med. Assoc., 7, 534-5, Oct. 18, 1947.

The A. M. A. finds no reason to anticipate injurious effects of any kind from ingestion of iodine in the amounts obtainable from the continued use of salt iodized to the degree contemplated by the pending legislation. Occasionally, persons are hypersensitive to iodine, but this group is small. The A. M. A. suggests that uniodized salt could be marketed under such designation as "Salt Deficient in Iodine."

88H. A slow dissolving, non-irritating salt tablet for use in hot environments.

CONSOLAZIO, W. V., PECORA, L. J., AND TUSING, T. *J. Ind. Hyg. Tox., 29,* 347-50, Sept. 1947.

A salt tablet impregnated with cellulose acetate or cellulose nitrate has been developed which dissolves very slowly and liberates its full amount of salt within approximately 80 minutes. This slow solution causes less gastrointestinal symptoms than present salt-cornstarch tablet or formerly pure salt tablet.

SUGARS, STARCHES, AND SYRUPS.

89H. The keeping properties of confectionery as influenced by its water vapor pressure.

GROVER, D. W. *J. Soc. Chem. Ind., 66,* 201-5 (1947).

A relation is established between the moisture vapor of a foodstuff with respect to that of the surrounding atmosphere and the extent to which the foodstuff is an acceptable medium for micro-organisms. Sucrose, confectioners' glucose, invert sugar, and several minor ingredients are studied singly and in combination.

90H. Method for dewatering starch conversion syrup.

SCHOPMEYER, H. H., HAMMERSTEIN, F. J., AND LARMOUTH, G. W. Assignors to American Maize-Products Co. 2,429,964, Oct. 28, 1947.

In making dried starch conversion syrup solids, the method which comprises evaporating starch conversion liquor, of reducing sugars content calculated as dextrose of 26 to 80%, to a heavy liquor of density not less than 30° Be. and not above that density at which the liquor when warm may be pumped, heating the thus concentrated liquor to a temperature of about 250° to 350° F. by causing it to flow rapidly over steam heated surfaces maintained at a temperature substantially above the temperature to which the syrup is to be heated, discharging the thus treated syrup continuously into an evacuated heated chamber so that quick evaporation of water from the heated syrup occurs and the water content is lowered to an amount not exceeding approximately 4%, maintaining the product after said evaporation at a temperature above the flow point thereof, withdrawing the resulting product in flowable form from the evacuated chamber, maintain-

ing the product during the withdrawing from the evacuated chamber at a temperature above the solidification point of the said product, so that it remains flowable, and then cooling the resulting material to cause solidification thereof, the method giving quickly a solidified syrup characterized by minimized development of both discoloration and objectionable flavor.

VEGETABLES

91H. The loss of ascorbic acid in the preparation of old and freshly harvested potatoes.

BRANION, H. D. *et al. J. Am. Diet. Assoc., 23,* 414-9, May 1947.

The percentage loss of ascorbic acid from new, freshly harvested potatoes during cooking was less than that from old potatoes. Loss of ascorbic acid from uncooked potatoes standing in water after peeling was low, but loss during storage in a refrigerator after cooking was high. Ascorbic acid was conserved to a greater degree when potatoes were cooked in their jackets but was readily lost when the method of preparation and cooking involved the cutting or breaking up of the potatoes.

92H. The loss of ascorbic acid in potatoes during storage.

BRANION, H. D. *et al. J. Am. Diet. Assoc., 23,* 420-2, May 1947.

The ascorbic acid content of potatoes decreased during storage, so that, at the end of 6 to 7 months after harvesting, 60 to 70% of that originally present had been lost. The ascorbic acid content of an individual variety of potato grown in different sections of the country, would appear to be reasonably constant.

93H. Chemical tests seeds for ability to sprout.

COTTRELL, H. J. *Nature,* May 31, 1947; *Sci. N. L., 51,* 377, June 14, 1947.

By means of the new chemical method, seeds can be tested for their ability to sprout in one tenth of the time required by the old-time germination test. Chemicals of the tetrazolium salt form colorless solutions in water, but when acted on by the enzymes present in germinating seeds change into insoluble red dyes. Samples of seeds that have been soaked overnight in water and split lengthwise to expose the embryo are just covered with the colorless tetrazolium solution and left in the dark, at moderately warm temperature, for four hours. Seeds of good viability will be stained bright red in the region of their growing parts.

PACKAGING

94H. Measurement of the gas permeability of sheet materials.

CARTWRIGHT, L. C. *Anal. Chem., 19,* 393-6 (1947).

Several types of gas permeability testers previously reported in the literature are discussed and their sensitivities compared. A new instrument, made of Pyrex, is described whose sensitivity is six times that of previous instruments, permitting detection within 24 hours of permeabilities as low as 0.052 cc. (N. T. P.) per square meter per 24 hours per atmosphere.

95H. Determination of gas permeability of Saran films.

SARGE, T. W. *Anal. Chem., 19,* 396-400, (1947).

A modified manometric apparatus is described for measuring gas permeabilities of films having extremely low transmission characteristics. Experimental results of equilibrium transmission for Saran films measured by a variable pressure technique are reported. The over-all results for Saran film gas transmissions are lower than those generally encountered in the literature for any organic film material.

96H. Cereal starch adhesive.

KESLER, C. C., AND RANKIN, D. Assignors to Penick & Ford, Ltd., Inc. 2,427,562, Sept. 16, 1947.

A starch adhesive composition adapted to be readily spread on a surface in the form of a thin substantially-continuous film comprising a gelatinized cereal starch in an aqueous alkali medium, a compound of an amphoteric metal for increasing the cohesiveness of the starch, and a water-dispersible aliphatic long chain bipolar organic compound.

PHYSICAL RESEARCH

97H. Structure of fibrous keratin.

FARRANT, J. L., REES, A. L. G., AND MERCER, E. H. *Nature, 159,* 535-6, Apr. 19, 1947.

It is suggested that fibrous keratin does not consist of long extended, or even partially folded chains, but of strings of globular molecules. The keratin fibrils appear to consist of protofibrils of fairly uniform size (100A. wide by 200A. long). The protofibrils are made up of a series of uniform particles of average diameter of 110A. It is concluded that these spherical particles represent the keratin molecule.

98H. Removal of bacteria from fluids.

HAM, G. P., AND BARNES, R. B. Assignors to American Cyanamid Co. 2,428,329, Sept. 30, 1947.

A process for removing bacteria from liquid media which comprises activating a granular dielectric material which is an unexhausted anion active material by applying a direct electric current potential of about 100-2000 volts thereto, in the presence of a liquid, by means of electrodes of such size and so spaced that the current passing between such electrodes when a liquid is present is insufficient to kill bacteria in the last mentioned liquid, and contacting the resulting activated dielectric material with a liquid medium containing bacteria.

99H. "Incipient shrinkage" of collagen and gelatin.

PANKHURST, K. *Nature, 159,* 538-9, Apr. 19, 1947.

A certain minimum water content is necessary before shrinking can take place in collagen and gelatin, even at temperatures as high as 100° C. It seems likely that the shrinking is caused by the rupture of some of the weaker cross-bonds of the protein molecule. This would permit local increases in compactness, followed on drying by the formation of new cross-bonds.

News of the Institute

EIGHTH ANNUAL CONFERENCE
INSTITUTE OF FOOD TECHNOLOGISTS

JUNE 6, 7, 8, 9, 10, 1948

HOTEL BENJAMIN FRANKLIN
PHILADELPHIA, PA.

Given first place in the Institute news, even though as yet incomplete, is the following program for the Eighth Annual Conference, submitted by Chairman Paul Logue of the Committee on Programs:

TENTATIVE PROGRAM

SUNDAY—JUNE 6, 1948

Council Meeting—President G. J. Hucker, presiding ..... 9:30 A.M.

Registration ..... 1:00-9:30 P.M.

Committee Meetings (to be scheduled).

Round Table Discussion

1. "Taste Panels"—Virgil O. Wodicka ..... 7:30 P.M.

MONDAY MORNING—JUNE 7, 1948

General Session.

Call to order ..... 9:30 A.M.

Address: President G. J. Hucker.

General Announcements ..... 9:50 A.M.

"Position of Food Technologists in National Emergency" ..... 10:00 A.M.
Col. Charles S. Lawrence, Commanding Officer, Food and Container Institute, Chicago.

"What Food Technology Has Done for Our Business" ..... 10:20 A.M.
H. J. Heinz II, Pres. H. J. Heinz Co., Pittsburgh, Pa.

"Survey of Food and Nutrition Research" ..... 10:50 A.M.
C. G. King, Nutrition Research Council.

Business Meeting ..... 11:20 A.M.

1. Annual Report of President.
2. Report of Secretary.
3. Report of Treasurer.
4. Report of Council Meeting.
5. Report of Standing Committees.
6. Election Officers Announced.
7. Adjournment.

MONDAY AFTERNOON—JUNE 7, 1948

Concurrent Session—A

Subject: General Problems of the Technologist.

Chairman:

1. "Problems of the Technologist in Successful Maintenance of Quality in Frozen Poultry" ..... 2:00 P.M.
   T. H. Ramsey, Birdseye-Snider Div., General Foods Corp., Pocomoke City, Md.

2. "Problems of Maintaining Quality by Controlled Distribution" ..... 2:35 P.M.
   Fred R. Pierce, Sales Manager, Tasty Baking Co., Philadelphia, Pa.

3. "Methods of Control in Production and Marketing of Certified Milk" ..... 3:10 P.M.
   Dr. J. Howard Brown, Johns Hopkins University, Baltimore, Md.

4. "Sanitary Construction of Floors and Buildings for Food Plants" ..... 4:00 P.M.

Boat Ride on the Delaware ..... 7:30 P.M.

Concurrent Session—B

Subject: Ion Exchange Resins.

Chairman:

5. "Ion Exchange Techniques Applied to the Food Industry" ..... 2:00 P.M.
   James C. Winters, The Resinous Products & Chemical Co., Philadelphia, Pa.

6. "Use of Ion Exchangers in By-Product Recovery of Pineapple Waste" ..... 2:45 P.M.
   George E. Felton, Hawaiian Pineapple Co.

7. "Developments in the Ion Exchange Purification of Beet Juices in the 1947-48 Campaign" ..... 3:30 P.M.
   B. N. Dickinson, Chemical Process Co., Redwood City, Calif.

8. "Ion Exchangers in Food Processing" ..... 4:15 P.M.
   A. B. Mindler, The Permutit Co., New York, N. Y.

TUESDAY MORNING—JUNE 8, 1948

Concurrent Session—C

Subject: Thickening and Jellying with High Polymers.

Chairman: George L. Baker.

9. "Physical Chemistry of Gelation of High Polymeric Systems" ..... 9:00 A.M.
   Rudolf Speicer, Department of Chemistry, Ohio State University, Columbus, Ohio.

10. "High Polymer Acid-Demethylated Pectinates and Their Gelation" ..... 9:30 A.M.
    G. W. Woodmansee and G. L. Baker, University of Delaware, Agricultural Experiment Station, Newark, Delaware.

11. "High-Polymer, Alkali-Demethylated Pectinates and their Gelation" ..... 10:00 A.M.
    G. H. Joseph or E. F. Bryant, California Fruit Growers Exchange, Corona, Calif.

12. "Pectase, Its Preparation and Activity" ..... 10:30 A.M.
    McColloch, New York Agricultural Experiment Station, Geneva, N. Y.

13. "High-Polymer, Enzyme-Demethylated Pectinates and Their Gelation"..... 11:00 A.M.
C. L. Hulls, Eastern Regional Research Laboratory, Philadelphia, Pa.

14. "Gelation with Acid-Precipitated, low Methoxyl Pectinates"..... 11:30 A.M.
H. S. Owens, Western Regional Research Laboratory, Albany, Calif.

CONCURRENT SESSION—D

Subject: Sterilization.

Chairman: C. R. Stumbo.

"Evaluation of the Effect of Heat Processing Upon the Organoleptic Quality of Canned Foods"..... 9:00 A.M.
C. Olin Ball, Consulting Food Technologist, Maumee, Ohio; Franklin C. W. Olson, Ohio State University, Put-In-Bay, Ohio, and Glen D. Boyd, Campbell Soup Company, Camden, N. J.

"An Exploration of the Effects of Strong Radio-Frequency Fields on Micro-Organisms in Aqueous Solutions"..... 9:30 A.M.
George H. Brown, and Wendell C. Morrison, R. C. A. Laboratories, Princeton, N. J.

"Spores and Spore Germination"..... 9:45 A.M.
O. B. Williams, University of Texas, Austin, Texas.

"A Technic for Studying Resistance of Bacterial Spores to Temperatures in the Higher Range"..... 10:00 A.M.
C. R. Stumbo, Food Machinery Corporation, San Jose, California.

TUESDAY AFTERNOON—JUNE 8, 1948

CONCURRENT SESSION—E

Subject: Pectin Standardization.

Chairman: Dr. Z. I. Kertesz.

"Pectin Grading"..... 2:00 P.M.
E. Everett Meschter, American Preserving Co., Philadelphia, Pa.

Axel G. Olsen..... 2:30 P.M.

H. H. Mottern..... 3:00 P.M.

George L. Baker..... 3:30 P.M.

"Continuous Manufacture of Jellied Substances"..... 4:00 P. M.
G. T. Reich, Philadelphia, Pa.

CONCURRENT SESSION—F

General Session.

"Improvement of Foods Through Program of Soil Improvement and Varietal Selection"..... 2:00 P.M.
Hester, Plant Pathologist, Campbell Soup Co., Riverton, N. J.

"Beverages of the World (Non-alcoholic)"..... 2:45 P.M.
E. C. Crocker, Arthur D. Little, Inc., Cambridge, Mass.; and Michel P. Vucassovich, Gorton-Pew Fisheries Co., Ltd., Gloucester, Mass.

"A Rational Method of Scoring and Grading Food"..... 3:30 P.M.
R. P. Plank, Karlsruhe, Germany.

"Foods for Infants, Invalids and the Aged"..... 4:15 P.M.
E. F. Kohman, Campbell Soup Co., Camden, N. J.

WEDNESDAY MORNING—JUNE 9, 1948

CONCURRENT SESSION—G

Subject: Frozen Foods.

Chairman: Frank A. Lee.

"Factors Affecting Discoloration of Bones in Frozen Poultry".....9:00 A.M.
J. G. Woodroof, Georgia Agricultural Experiment Station, Experiment, Ga.

"Use of Liquid Sugars in Freezing of Peaches, Apricots and Nectarines".....9:30 A.M.
M. A. Joslyn, Division of Food Technology, University of California, Berkeley, Calif.

"Freezing of Apple Slices".....10:00 A.M.
Wm. B. Esselen, Jr., University of Massachusetts, Amherst, Mass.

"Ascorbic Acid and its Relation to Color and Flavor".....10:30 A.M.
Clarence DuBois, Westport, Conn.

" ".....11:00 A.M.
Willis A. Gortner, School of Nutrition, Cornell University, Ithaca, N. Y.

"A New Crystallographic Method for Study of Changes in Processed Foods".....11:30 A.M.
Hanz Friess, Karlsruhe, Germany, Presented by R. P. Plank.

CONCURRENT SESSION—H

Subject: Control.

Chairman:

"Statistical Quality Control as Applied to the Food Industry."
Marjorie L. Sutherland.

"Role of Control Instruments in Continuous Food Processing."
Lloyd Stater, Brown Instrument Co.

"Insect Control by Contact Methods."
Warren J. Hewes, Capitol Chemical Co., Washington, D. C.

"Rodent Control by Bait and Poison Feed."
John W. Quinn, Capitol Chemical Co., Washington, D. C.

"Methyl Bromide Fumigation in the Sanitation of Food Processing Plants."
F. W. Fletcher, Dow Chemical Co., Midland, Mich.

"Application of the Electron Microscope in Food Research."
Paul A. Greenmeyer, Radio Corporation of America, Camden, N. J.

WEDNESDAY AFTERNOON—JUNE 9, 1948

CONCURRENT SESSION—I

Subject: Technical Fisheries Education.

Chairmen: C. R. Fellers, Louis Berube.

CONCURRENT SESSION—J

Subject: Amino Acids.

Chairman: M. J. Blish.

"Use of Soybean Flour in Baking Industry."
L. G. Trempel, A. E. Staley Mfg. Co., Decatur, Ill.

THURSDAY—JUNE 10, 1948

PLANT TRIPS, including all day trips to Deerfield Farms, Campbell Soup Co., etc.

FOOD TECHNOLOGY AWARD

At the meeting of the Council of the Institute of Food Technologists in January, it was voted to accept a grant from The Nutrition Foundation to support an annual award for outstanding contribution of food technologists. The award of $1,000 will be made annually to that person, selected by a jury of the Institute of Food Technologists, who shall have made an outstanding contribution to food production, processing, packaging, storage or distribution, having an important bearing on public health as a result of better nutrition. A committee has been appointed to draw up the rules for the selection of the recipient. This committee will also act as the jury for the selection of the 1948 recipient.

The grant to I. F. T. is one of four made by The Nutrition Foundation for the encouragement of scientific, technological, and clinical contribution to better human nutrition. The other three societies through which these awards will be made are the American Institute of Nutrition, the American Dietetics Association, and the American Medical Association.

The Nutrition Foundation, with offices at Chrysler Building, New York, was organized in 1941 by leading business men in the food industry to support education and fundamental research in the science of nutrition.

The Foundation functions largely through grants to research and through the publication of "Nutrition Reviews."

During the past six years, 54 food companies have contributed over $3,000,000 to the Foundation.

POSSIBILITY OF NEW REGIONAL SECTIONS

Ames, Iowa, may be the seat of the newest I. F. T. Regional Section. An organizational meeting was held there November 14, 1947, with 52 individuals present. Ralph Goodale was elected pro-tem Chairman and Bob Tischer, formerly of the Northern California Section, was elected Secretary-Treasurer. Congratulations and good luck!

Our National Secretary, Professor Carl R. Fellers, advises that inquiries have been received for possible regional sections from Indianapolis, Cincinnati, Minneapolis, Toronto, Canajoharie, and Rio Grande Valley.

OSBORNE MEDAL AWARD

Dr. Betty Sullivan, member of the Chicago Section of I. F. T., has been designated as the next recipient of the Thomas B. Osborne Medal Award of the American Association of Cereal Chemists, for conspicuous achievement in cereal chemistry research.

COMMITTEE APPOINTMENTS

President Hucker has appointed a committee to study the award of the Nutrition Foundation and nominate a recipient, if possible, for 1948. The Chairman of this committee is Dr. Roy C. Newton.

An Organization Policy Committee has also been appointed by President Hucker to study the business affairs of I. F. T. and to look into the matter of combining all its present functions in the office of a part- or full-time paid Executive Secretary. The Chairman of this committee is Ernest E. Jacobs, Secretary of the Northern California Section.

CONSTITUTION AMENDED

Twenty-one amendments to the Constitution have been adopted by the membership—each by a majority of at least 10 to 1.

The amendments were approved on September 9, 1946 by the Committee on Constitution (C. O. Ball, chairman, H. O. Halverson, M. A. Joslyn, J. T. Knowles, Paul Logue, C. S. Pederson, F. L. Seymour-Jones, and L. F. Stoloff) and were recommended to the Council on June 1, 1947, for approval by a majority of the membership.

A digest of the amendments follows:

1. Heading "Objectives" inserted for Article III.
2. Article III was revised.
3. Article V was amended to provide the following officers of the Institute: President, President-Elect, Vice-President, and Secretary-Treasurer.
4. Article V, Section 2, was added to provide for a new method of appointing alternate Councilors at Large.
5. Article V, Section 3, was added, in respect to Councilors representing regional sections.
6-10. Article VI, Sections 3, 4, 7, 9, and 10 were amended to provide a new election procedure.
11, 14-18. Article VIII, Sections 1, 3, 4, 5, 6, and 7 were amended in respect to the appointment of committees.
12. All references to corporate membership were deleted from the Constitution.
13. Article VIII, Section 2, was deleted from the Constitution.
19. Article XI, Section 2, was amended in respect to forfeiture of membership.
20. Article V, Section 2, of the regional section by-laws was amended in respect to the order of succession to the chairmanship.
21. Article V, Section 5, of the regional section by-laws was amended in respect to re-election of officers.

In accordance with a request of the Council, the revised Constitution is printed in full on the pages which follow the regional section news.

ACCIDENT

Our Past President, Dr. Fred C. Blanck, of the Mellon Institute Research Staff, recently had an accident on the icy streets of Pittsburgh and broke his leg, requiring hospitalization. We all express our regrets and hope that he will have a rapid recovery.

IN MEMORIAM

Dr. Stroud Jordan, who died on December 28, 1947, at the age of 62 years, served from 1934 through 1947 as Chief of the Bureau of Standardization, Department of Purchase, New York City. Since 1938 he had been with the American Sugar Refining Company. Dr. Jordan was deeply interested in the Institute of Food Technologists and had served it in several capacities, including a year as Chairman of the New York Section and several years as a Councilor of the national organization. In the passing of Dr. Jordan, the New York Section and the national Institute of Food Technologists have sustained a serious loss. His technological accomplishments commanded the greatest respect, and he was esteemed for his companionship, graciousness, and humanly philosophical attributes.

NOTICE

The annual meeting of the Society of American Bacteriologists will be held in Minneapolis, Minnesota, May 10 to 14, 1948, with headquarters at the Nicollet Hotel. There will be sessions on general agriculture, industrial and medical bacteriology, as well as immunology and comparative pathology.

Regional Section News

CHICAGO SECTION

Initiative has again been shown by the Chicago Section, which has now launched a publication called *The Vitalizer*. The first issue, a 16-page bulletin, appeared in February 1948, and the plan is to publish the bulletin each month except July, August, and September. The name of the publication stems logically from the idea that food is a vitalizer.

Dr. Lloyd A. Hall is the Editor, Milton E. Parker the Managing Editor, Byron M. Shinn the Business Manager, Leo A. Rauch the Advertising Manager, and there are ten contributing editors. The main objectives of the bulletin are to bring Chicago Section members announcements of meetings, to introduce speakers, to submit the transactions and actions of the Section's officers and Executive Committee, to advise of various committee reports, to give a complete resumé of Section business activities, and to report interesting news. The editors hope that each member will contribute his part to help make *The Vitalizer* a vehicle of the pioneering spirit of the Chicago Section, which is characterized by the motto of Chicago itself, namely, "I will."

Our best wishes to the Chicago Section for the success of their bulletin and our compliments on the fine appearance of their first issue. It is to be hoped that other sections of I. F. T. will soon follow the example set by the Northern California Section in its *Hornblower* (initiated in 1947) and by the Chicago Section in its *Vitalizer*.

Previous meetings of the Chicago Section have included the following speakers and topics:

October 20, 1947. Dr. E. W. Gaumnitz, Executive Secretary, National Cheese Institute. Subject: "New Technological Developments in Cheese Making and Packaging."

November 17, 1947. Mr. Robert I. Tenney, President, Wahl-Henius Institute. Subject: "How the Brewer Uses Technology."

December 15, 1947. Dean J. Roscoe Miller, Northwestern University Medical School. Subject: "Know Your Heart."

January 19, 1948. Dr. Austin Smith, Director, Division of Therapy and Research, and Secretary of the Council on Pharmacy and Chemistry of the American Medical Association. Subject: "Food Therapy."

February 16, 1948. Mr. M. R. Stevens, Chief, Chicago Station, U. S. Food and Drug Administration. Subject: "Some Aspects of the Enforcement of the Federal Food, Drug and Cosmetic Act."

A distinguished guest at the January meeting was Dr. J. Dedek of Brno, Czechoslovakia.

At the December meeting, officers for 1948 were elected as follows:

Chairman	E. S. Stateler
Vice-Chairman	C. L. Smith
Secretary	J. M. Jackson
Treasurer	B. M. Shinn
Executive Committee (1948-49 term of office)	G. W. Beach and L. A. Hall
Section Councilors (1948-49 term of office)	C. L. Smith and A. E. Stevenson

For the first time in its history the Chicago Section will be addressed by a lady. On March 15, Dr. Helen Oldham of the Department of Home Economics, University of Chicago, is to give a paper on "Experiences and Impressions While on a Special Food Mission to Germany." In May 1947, Dr. Oldham was requested by

the Secretary of War to make a study of nutrition in Germany and was one of a team of three home economists selected for the assignment. Her message will be of interest to food technologists for its technical and political aspects.

At the February meeting plans were presented to the membership for participation of the Chicago Section in a special panel of the Chicago Technical Society Council's Conference, to be held March 23. The Chicago Section has voted to pledge $50 to this Council as a contribution toward a building survey fund for preparation of a brochure to be used in raising money for a proposed Sci-Eng-Tech building in downtown Chicago. This pledge is contingent upon a sufficient amount being raised by the CTSC Building Committee to finance such a survey.

Thus far 1948 has been a busy meeting year for many members of the Chicago Section. During the week of January 4 the Continental Can Company held their annual Fieldmen's Meeting in Oak Park, Illinois. During the week of January 18 a number of the Section members (including R. R. Fulton, R. I. Miller, and B. M. Shinn) attended the meeting of the National Canners Association at Atlantic City. During the week of January 25 the Fourth Inter-Laboratory Conference of the Research Division of the American Can Company was held at their Central Laboratory at Maywood, Illinois.

Several I. F. T. members, including representatives of the Chain Belt Company, Libby, McNeil & Libby, Minnesota Valley Canning Company, and American and Continental Can Companies have participated in meetings at Chicago and Milwaukee as representatives of the Blancher Improvement Committee of the N. C. A. Can Manufacturers Institute Nutrition Committee.

At a symposium on "Flavor and Acceptability of Monosodium Glutamate" to be held in Chicago on March 4, sponsored by the Quartermaster Food and Container Institute for the Armed Forces, papers will be given by Chicago Section members as follows:

Dr. Paul D. V. Manning, Vice-President in Charge of Research, International Minerals and Chemical Corporation, Chicago, and Dr. B. F. Buchanan, Director of Technical Service Department, Amino Products Division, International Minerals and Chemical Corporation, Chicago. Subject: "Quality Production of Glutamates."

Dr. Lloyd A. Hall, Director of Research, Griffith Laboratories, Inc., Chicago. Subject: "Protein Hydrolysates as a Source of Glutamate Flavors."

At this same symposium, I. F. T. members from other regional sections will present papers as follows:

Dr. A. E. Marshall, President, Rumford Chemical Works, Rumford, R. I. Subject: "The History of Glutamate Production."

Mr. Stephen L. Galvin, Technical Service Director, Huron Milling Company, Inc., New York, N. Y. Subject: "Taste of Glutamate and Other Amino Acid Salts in Dilute Solutions."

Mr. John H. Nair, Assistant Director of Research, Continental Foods, Inc., Hoboken, N. J. Subject: "Evaluation of Glutamate in Food Specialties."

Dr. M. L. Anson, Director of Chemical Research, Continental Foods, Inc., Hoboken, N. J. Subject: "The Relation of Glutamate to the Browning Reaction."

At the Second National Frozen Food Exposition and Convention to be held in Chicago on March 15 to 18, Dr. L. V. Burton (Executive Director of the Packaging Institute) will present a paper on "Domestic and International Food Problems," and Dr. J. M. Lemon (Chief Technician, Fish and Wildlife Service, Washington, D. C.) will discuss "Technological Problems in the Frozen Fish Industry."

Dr. Lawrence W. Bass has been elected a Vice-President of U. S. Industrial Chemicals, Inc. Dr. Bass was a member of the Council of I. F. T. during its first year of organization and played an active part in organizing and directing the second Annual I. F. T. Conference in Pittsburgh in 1941. He is also a former President of

the American Institute of Chemical Engineers and a member of the Board of Directors of the American Chemical Society.

Dr. John P. Neilsen has been appointed direct freezing research head for Libby's frozen food quality control department. Dr. Neilsen, formerly quality control director of California Frozen Foods, Inc., Modesto, will make his headquarters at Sunnyvale, California.

Dr. Robert E. Buck, formerly of the Quartermaster Food and Container Institute for the Armed Forces, has joined the H. J. Heinz Company, Pittsburgh, Pennsylvania, as Head of the Department of Process and Product Research in their research laboratories.

Milton L. Laing, Chief Chemist, Quality Control Division, Armour & Company, has returned from a business trip to the Orient, including Singapore and Penang.

V. Del Giudice gave a talk before the Park Manor Women's Club on "Facts, Fables and Foibles About Foods," one of the subjects suggested by the Chicago Section's Speaker's Bureau.

The Tenth Annual Conference of I. F. T. is scheduled to be held in Chicago in 1950.

NORTHERN CALIFORNIA SECTION

The annual report of the Secretary (Ernest E. Jacobs) given on December 4, 1947, regarding the activities of the Northern California Section points out that the 1947 Executive Committee was responsible for three important steps: the Employment Service, the Lapel Badges, and the *Hornblower*.

The Secretary's report also states that it was decided to hold the 1948 dues at $2 and not make an additional assessment for the 1949 Convention.

According to the Secretary, the membership of this Section has increased from 246 national members and 60 regional associates to 275 national members and 53 associates. This membership may entitle the Northern California Section to a fourth National Councilor.

On December 4, 1947, the following national members were enrolled in the Section: Dr. Charles Stumbo, Dr. C. A. Gates, and Will Phillips. The following were approved as members: Boyd Preble, George Dorlite, Dwaine Brewster, Leonard Wasserman, Robert Stewart, John Bercovitz, Frank McGugin, James Edwards, Paul Davis, and Miss Amy Seymour.

On January 6 new members were approved as follows: M. Giriraj, student; Wesley Noble, reinstated; Dr. Wilbur S. Claus, a national member in this area.

At this January meeting Ray Junk and Hugh Griswold were voted full authority to take actions necessary to get the 1949 National Meeting under way.

During 1948 regular meetings of the Northern California Section will be held the third Thursday of alternate months, beginning February, except in emergencies.

At this same January meeting a complete staff for the *Hornblower* was appointed, $300 was appropriated for expenses, and a separate bookkeeping account was started for the publication.

On February 19 the Section was addressed by Dr. Ernest Guenther, Chief Chemist and Vice-President of Fritzsche Brothers, Inc., who spoke on the subject "Production of Essential Oils in the Western Hemisphere." The talk was accompanied by motion pictures of this industry. Other technical and scientific groups of the Bay Area were invited to attend.

A new feature appearing in the January 1948 issue of the *Hornblower* is a section entitled "Message from the Section Chairman."

NORTHEAST SECTION

On January 26, members of the Northeast Section heard talks by two speakers, as follows:

Dr. Frank J. Yourga, Chief, Food Processing Branch of the Research Division, Hartford-Empire Company, Hartford, Conn. Subject: "Glass Packaging Specifications."

Dr. William B. Esselen, Jr., Department of Food Technology, University of Massachusetts, Amherst. Subject: "Developing Heat Processes for Canned Foods."

The March meeting of this Section will be held in the ice-cream plant of H. P. Hood and Sons, Inc., in Boston. The speakers will be Dr. Arthur C. Fay, Director of the Hood Laboratories, and Professor William S. Mueller, of the Department of Dairy Industry, University of Massachusetts.

Mr. Robert S. Scull, of the Burnham and Morrill Company, Portland, Maine, and our Section Secretary Mr. John J. Austin, of Austin Industries, Concord, Mass., served as representatives of the Northeast Section at the I. F. T. Council Meeting held in Atlantic City on January 20.

At a seminar held in the Food Technology Laboratories at Massachusetts Institute of Technology on February 17, Dr. Ernest C. Crocker, of Arthur D. Little, Inc., presented a paper on "Beverages."

At the Second National Frozen Food Convention to be held in Chicago on March 15-18, a paper entitled "The Improvement of Frozen Foods through Microbiology and Sanitation" will be given jointly by Professor Bernard E. Proctor of M. I. T. and Dr. J. T. R. Nickerson. Until recently Dr. Nickerson was Chief Chemist of the Hygrade Food Products Corporation, Boston, but now is Chief Chemist of the National Association of Food Packers in Washington, D. C.

At the symposium on "Flavor and Acceptability of Monosodium Glutamate" to be held in Chicago on March 4 under the auspices of the Quartermaster Food and Container Institute for the Armed Forces, papers will be given by members of the Northeast Section as follows:

Dr. Carl R. Fellers, Department of Food Technology, University of Massachusetts, Amherst, Mass. Subject: "The Use of Monosodium Glutamate in Sea Food Products."

Dr. Ernest C. Crocker, Arthur D. Little, Inc., Cambridge, Mass. Subject: "Meat Flavor and Observations on the Taste of Glutamate and of Other Amino Acids."

Dean Samuel C. Prescott of Massachusetts Institute of Technology started in February on an extended trip to the South and the West Coast. During this trip he will probably visit the I. F. T. Regional Sections in Los Angeles and San Francisco.

Mr. Wendell P. Turner, Jr., of Melrose, Mass., recently joined the staff of Arthur D. Little, Inc., Cambridge, Mass., in its food division.

Mr. Lawrence P. Abare, of the First National Stores, Inc., Somerville, Mass., has been promoted to the important post of Assistant Plant Manager in their Somerville Warehouse.

Mr. Walter M. Kneeland has joined the staff of Bowey's, Inc., in Chicago, as Food Technologist.

Mr. Michel P. Vucassovich, of the Gorton-Pew Fisheries Company, Gloucester, Mass., has requested that his address be changed to Crows Nest, Hesperus Avenue, Gloucester, Mass. It might be added that he has a very beautiful residence in Gloucester, high on the cliffs, near the famous Rafe's Chasm.

Mr. Mason T. Rogers, of the Dewey and Almy Chemical Company, Cambridge, Mass., and President of the Packaging Institute, recently addressed a seminar at the University of Delaware, Newark, Delaware, on the subject of "Food Packaging."

SOUTHERN CALIFORNIA SECTION

On December 17, 1947, the Southern California Section held its 46th meeting in Los Angeles. Members and guests, numbering one hundred and thirty-seven, were conducted through the new headquarters of the United-Rexall Drug Company and were served dinner in its auditorium.

In a business meeting following the dinner, the Membership Committee reported plans to contact by mail several hundred persons employed in the food industry throughout the Los Angeles area, to inform them regarding the functions and activities of the Institute of Food Technologists. The Membership Committee is urging affiliate members to apply for full membership and local affiliates to apply to the national organization for official membership in I. F. T.

After the business meeting, the members heard talks by:

1. Miss C. S. Hilegas, who described the organization of the United-Rexall Drug Company.
2. Miss A. Birkett, who told about the functions and activities of the Gales Soda Foundation Test Laboratory, and
3. Dr. Philip K. Bates, Director of the Products Development Department at the United-Rexall Drug Company, who discussed the functions and activities of the Rexall Products Development Laboratories.

The 47th meeting of this Section was held on January 21, at which seventy-three members and guests were present. Announcement of the meeting had been sent to members of the Los Angeles Chapter of the American Society of Bakery Engineers and the California Dairy Industries Association, and many of the guests were from these two groups.

The subject of discussion at the January meeting was "The Dairy Industry and its Technical Problems." The speakers were:

1. Mr. Paul Stocklin, Production Manager, Challenge Cream and Butter Association. Mr. Stocklin, who had arranged the program of the evening, briefly reviewed the scope of the dairy industry in California and presented a short talk on modern methods of butter and powdered milk production.

2. Mr. W. C. Cole, Director of Research, Arden Farms Company. He discussed technical problems concerned with market milk, evaporated milk, and ice cream production.

3. Dr. Milton Powell, Director of Research, Knudsen Creamery Company, who discussed the manufacture of by-products from milk, including whey and cheese. Dr. Powell supplemented his discussion with a demonstration of over twenty varieties of foreign and domestic cheeses.

On February 20, the Southern California Section held its Second Annual Conference at the University of California, Los Angeles. This all-day conference was on the subject of "Sanitation in the Food Industry," a program prepared by Dr. Arthur Prater, Chairman of the Program Committee, and his colleagues.

The speakers and topics discussed at the Second Annual Conference were as follows:

Mr. F. Leslie Hart, Chief Chemist, Los Angeles Station, U. S. Food and Drug Administration. Subject: "Laboratory and Plant Detection of Insanitation."

Mr. W. W. Ache, Architect, and Mr. Leland Evison, Architect, Pasadena. Subject: "Architecturally Planned Sanitation."

Professor Reese H. Vaughn, Division of Food Technology, University of California, Berkeley. Subject: "Some Aspects of Sanitation Relating to Continuous Control of Microorganisms in Food Processing."

Mr. W. D. Lewis, Sanitarian, National Canners Association, Western Branch Research Laboratories, San Francisco. Subject: "Sanitation and Cleaning Procedures in the Canning Industry."

Professor J. W. Bartholomew, Bacteriology Department, University of Southern California, Los Angeles. Subject: "Importance of Air Sanitation to the Food Processor."

Mr. Sydney A. Moss, Attorney-at-Law, Los Angeles. Subject: "Food Products Liability,"

It is planned to publish the speeches given at this February meeting in the second number of Volume I of the Proceedings of the Southern California Section of the Institute of Food Technologists.

On March 17, members of the Section met at the Country Club in Montebello to hear three speakers on the following subjects:

Dr. F. A. Gunther, Assistant Insect Toxicologist, U. C. Riverside. Subject: "Chemical Studies of the Newer Insecticidal Materials."

Mr. C. Birdseye, Birds-Eye Frozen Foods. Subject: "The Current Food Situation in Portugal and Spain," and "Newer Aspects of Frozen and Dehydrated Foods."

Col. C. S. Lawrence, Quartermaster Food & Container Institute for the Armed Forces. Subject: "The Program of the Food and Container Institute."

NEW YORK SECTION

At the November meeting of the New York Section, Mr. Charles W. Kaufman, Assistant Manager, Research and Development Department, General Foods Corporation, New York, gave a talk on the subject of "Factors Influencing the Stability of Foods."

Professor H. J. Masson, of the Department of Chemical Engineering, New York University, addressed the Section at its January meeting on the "Role of the Chemical Engineer in the Food Industry."

At its February meeting, the New York Section heard Mr. Laurence V. Burton, Executive Secretary of the Packaging Institute, speak on "Problems to Overcome in the Development of Continuous Processes for Food Production."

FLORIDA

Mr. George N. Pulley, of the Kuder Citrus Pulp Company, Lake Alfred, Florida, has been appointed Secretary to fill the unexpired term of Dr. R. B. McKinnis, who has moved from the area.

WESTERN NEW YORK SECTION

The March meeting of the Western New York Section is to be in the form of an open forum on various phases of food technology, such as packaging, processing, and process equipment. Members of the local section working in these fields will carry on discussions with those attending the meeting. This meeting is to be held at the New York State Agricultural and Technical Institute, Morrisville, New York, in cooperation with the Food Preservation Department.

The annual spring meeting will be held in April at Buffalo and will consist of an afternoon program followed by dinner and a dinner speaker.

GREAT LAKES SECTION

The winter meeting of the Great Lakes Section was held on January 16 and included three features. The first was a talk by Mr. Lynn Fry, Supervisor of Plant Extension at the University of Michigan. His topic was "Equipment and Food Handling Methods in the New University Food Service." Mr. Fry showed floor

plans for the new Food Service Building at the University of Michigan. This building, started in 1946, will be ready for use in March 1948.

Following Mr. Fry's talk, there was a Symposium on Freezing. The discussion leader was Dr. Roy E. Marshall, of Michigan State College, who gave a brief review of the frozen food packing industry. Mr. Gerald A. Fitzgerald, Director and Secretary of the Frozen Food Foundation, Inc., Syracuse, New York, then reviewed early deep freezing, outlined the history of the frozen food industry in the late 1920's, and discussed some of the difficulties he has encountered during twenty years of interest in the subject. He also discussed the need for better varieties of fruits and vegetables, the need for correct harvesting and speed in moving products quickly to processing plants, and the factors that affect frozen foods. This first attempt at a symposium type of program was well received.

In the evening Dr. W. L. Badger, formerly of the University of Michigan and now a consulting chemical engineer, gave an interesting illustrated lecture to members of the Section on two trips made by him recently through England, Switzerland, Holland, Sweden, and Belgium, and discussed the food situation in these countries.

The spring meeting of the Great Lakes Section will be held at the Engineering Society of Detroit on April 23.

The American Society for Horticultural Science, at its last annual meeting in Chicago, added a Processing Section to its established sections on Fruit, Vegetables, and Ornamental Horticulture. Dr. Roy E. Marshall was elected Chairman of this section and will preside at the first meeting in Cincinnati in September.

Undergraduate and graduate majors in Food Technology and allied curricula at Michigan State College have organized a Food Technology Club, which has been officially recognized by the College Administration. The initial membership is twenty-eight.

PHILADELPHIA SECTION

On February 13, Mr. William Sivyer, Philadelphia Manager of the Chain Belt Company, addressed the Philadelphia Section on the subject "Economics in Conveying," with special emphasis on conveying foods.

The Philadelphia Section mailed in February its first publicity announcements regarding the Eighth Annual Conference of I. F. T., to be held in Philadelphia June 6-10, 1948. The material includes a map of Central Philadelphia, showing transit lines, hotels, railroad stations, and principal places of interest, a pamphlet concerning the history of Philadelphia, and a hotel reservation card. The Convention Committee are to be congratulated on doing an outstanding job on this publicity material.

Another of the seminars on Food Technology was held at the Campbell Soup Company in Camden, New Jersey, on March 4. The subject of this seminar was "Separation of Solids."

On March 11 the Philadelphia Section will meet at the Drexel Institute of Technology for an informal get-together night. There will be a business meeting for the election of officers for 1948-1949, and the plans for the National Convention in June will be discussed. Subsequently there will be discussions with leaders as follows:

Sugar and Preserves	G. T. Reich, Leader
Dairy Industry	J. J. Sampey, Leader
Education	W. L. Obold, Leader
Canning and Freezing	E. F. Kohman, Leader

MARYLAND SECTION

The Maryland Section's first meeting of the year was held on January 9, when an interesting lecture on "Yeast" was given by Mr. F. A. Feild of the Federal Yeast Corporation, of Colgate, Md.

On February 13, there was a lecture by Mr. John H. Nair on the "Non-Enzymatic Browning of Foods."

A lecture course on "Food Technology—Principles and Practices" is being sponsored by the Maryland Section and the Graduate School of the United States Department of Agriculture, Washington, D. C. Leading specialists from the food industry will present the latest information about food technology, including processing, preparation, packaging, and storage of a wide variety of foods and food products. The lecture course is under the technical direction of Dr. A. H. Warth, Chemical Director of Crown Cork and Seal Company, and members of the Maryland Section of the Institute of Food Technologists.

These lectures began on February 4 and will continue through May 12. Those taking the lectures are given credits toward their degrees. Others interested may enroll upon registration and payment of a fee.

PUGET SOUND SECTION

On February 3, at a dinner meeting held in Seattle, Washington, Mr. Frank Alexander of the Hoffman LaRoche Laboratory addressed members of the Puget Sound Section on the subject "Vitamin Applications to Foods in the Pacific Northwest." In his talk Mr. Alexander included descriptions of the uses of vitamins, such as fortification, restoration, and antioxidant application.

ST. LOUIS SECTION

On March 4, members of the St. Louis Section heard a talk by Virgil O. Wodicka on "Methods of Taste Testing." The paper was followed by a discussion of taste testing methods used in various industries, and several members of the Section described briefly the procedures used in their plants.

INSTITUTE OF FOOD TECHNOLOGISTS
CONSTITUTION

ADOPTED
FEBRUARY 13, 1948

ARTICLE I

This society shall be a professional society called the Institute of Food Technologists.

ARTICLE II

Definition of Food Technology

Food Technology is the technological application of science and engineering to the manufacture and handling of foods. Food Technology is primarily based on the fundamentals of chemistry, physics, biology and microbiology, any of which sciences may find expression through an engineering operation. Knowledge of Food Technology enables its possessor to develop new products, processes, and equipment, to select proper raw materials, to understand and control food manufacturing operations, to solve technical problems of food manufacture and distribution, including those involved in plant sanitation, and those affecting the nutritional value and public health safety of foods and to know the fundamental changes of composition and of physical condition of foodstuffs which may occur during and subsequent to the industrial processing of the foodstuffs.

ARTICLE III

Objectives

The objectives of the Institute shall be: To facilitate interchange of ideas among its members, to stimulate scientific investigations into technical problems dealing with the manufacture and distribution of foods, to promulgate the results of research in food technology, to offer a medium for the discussion of these results, to plan, organize, and administer projects for the advancement and application of science insofar as it is fundamental to a wider knowledge of foods, to encourage food manufacturers to employ qualified food technologists in the technical direction of manufacturing and distributing operations, and to promote the improvement of conditions of employment for food technologists.

ARTICLE IV

Membership

SECTION 1. The Institute shall have three classes of members: Members, affiliates, and associates.

SECTION 2. Any person who is ethically qualified and who has had training and experience in food technology as defined in Article II and in this Section, or any person who, in the opinion of the Council, is recognized as distinguished in the contributing sciences as they apply to foods, shall be eligible to be a Member of the Institute. The minimum training which shall qualify a candidate for eligibility for membership as a Member is, in general, graduation from a college, university, or similar institution in which he has majored in one or more of the sciences or branches of engineering associated with food technology. The minimum experience which shall qualify a candidate for eligibility for membership as a Member shall be three years in food technology. Any person who lacks the prescribed professional training but who, in the opinion of the Council, through long experience has distinguished himself in food technology shall also be eligible for membership as a Member.

SECTION 3. Any person who is ethically qualified and who is active in special or limited aspects of food technology, including the dissemination of knowledge of food technology, or any scientifically trained person who is looking forward to a career in food technology shall be eligible to become an affiliate. When qualified by later training or experience as defined in Article II and Article IV, Section 2, an affiliate may, upon application, be elected to membership as a Member. An affiliate is not eligible to serve on the Committe on Programs.

SECTION 4. Persons who are officially employed in municipal, state or federal regulation of the food industries and who may not qualify for membership as Members but who wish to be associated with the Institute of Food Technologists are eligible to be elected as associates. Associates may serve on committees except that on Programs.

SECTION 5. All classes of members shall enjoy privileges of the Institute with the following exceptions: only Members shall be officers (President, President-Elect, Vice-President, Secretary-Treasurer); voting privileges, except within committees, shall be confined to Members eligible to become officers; affiliates and associates shall not be eligible for election to the Council.

SECTION 6. The Secretary-Treasurer shall supply suitable forms for application for membership and printed copies of the constitution to persons who are seeking membership in the Institute.

SECTION 7. Members, affiliates, and associates shall pay such membership dues as may be determined by the Council.

ARTICLE V

Officers and Council

SECTION 1. The officers of this Institute shall be a President, a President-Elect, a Vice-President, a Secretary-Treasurer. The President-Elect shall be elected annually by letter ballot for a term of four months, following which term the President-Elect shall succeed to the office of President for a term of one year. The Vice-President and Secretary-Treasurer shall be elected annually by letter ballot for a term of one year. The Council shall consist of the four officers, the most recently retired ex-President, ten elected Councilors at Large, and duly elected representatives of regional sections of the Institute as provided in Article XIV, Section 6. The President-Elect shall be eligible for re-election for one term. In case such re-election occurs during his first term as President, he will serve as President during his second term as President-Elect. The Vice-President shall be eligible to serve for a second term. The Secretary-Treasurer shall be eligible for re-election. The duties of the President, Vice-President, and Secretary-Treasurer shall be such as usually pertain to their offices or may be designated to them by the Council or by the Institute. The duties of the President-Elect shall consist of building an organization for carrying on the functions of administration during his term as President and of becoming acquainted with the nature and activities of the Institute. By the time of the termination of his office tenure as President-Elect, he shall have drafted all committees that are required under the provisions of Article VIII of this Constitution. Five Councilors at Large shall be elected each year for terms of two years each. Only Members of the Institute are eligible to be Councilors at Large. Councilors at Large shall not be eligible for re-election until the election following the expiration of their terms except that Councilors at Large who shall have been appointed or elected to fill unexpired terms as provided in Article VI, Section 13, shall be eligible for immediate re-election. Except for the President-Elect, the duties of office shall start at the beginning of the next fiscal year following the election. The duties of the office for the President-Elect shall start four months prior to the beginning of the next fiscal year following the election.

SECTION 2. If a Councilor at Large shall be unable to attend a regularly called meeting of the Council, he may designate an alternate Councilor at Large to attend the Council Meeting as a substitute for himself, which alternate Councilor at Large shall, after having presented proper credentials in the form of a letter from the President, have full power to function as a Councilor at Large in that meeting. In case the Councilor at Large shall fail to designate an alternate, the President of the Institute may do this. Eligibility requirements of an alternate Councilor at Large shall be the same as those of a regularly elected Councilor at Large.

SECTION 3. Councilors representing regional sections shall be Members, associates or affiliates, provided that a regional section may elect an associate or an affiliate to represent it in the Council only in case at least three-fourths of the Council membership at the time of the election shall consist of Members of the Institute.

ARTICLE VI

Nomination and Election of Officers and Councilors at Large

SECTION 1. Officers and Councilors at Large shall be chosen by ballot from a list of nominees prepared by the Committee on Nominations in the manner prescribed in Article VI, Sections 5, 6, 7 and 8.

SECTION 2. One Councilor representing each 100 Institute members or fraction thereof in each authorized regional section of the Institute shall be considered elected to the Council upon certification of such choice by the Secretary of the authorized regional section of the Institute to the President and Secretary-Treasurer of the Institute. Eligibility to hold office as a Section Councilor shall be the same as for Councilor at Large as stated in Article V, Section 1 and Article XIV, Section 6.

SECTION 3. The Secretary-Treasurer, at least 9 months prior to the annual meeting of the Institute, shall send to each Member of the Institute in good standing a blank nominating ballot upon which the Member may make nominations for the officers and Councilors at Large to be elected at the coming annual election. Each blank nominating ballot shall carry a list of the names of at least five Members who are eligible to hold each office that is to be filled in the election and a list of the names of at least fifteen Members who are eligible to be elected as Councilors at Large. The names in these lists will be those of Members who are recommended by the Committee on Nominations for consideration by the voters. Each blank nominating ballot shall carry blank spaces in which the name of one suggested candidate for each office that is to be filled in the election and the names of five suggested candidates for Councilor-at-Large may be written. Each blank nominating ballot shall bear the printed statement that the name of any eligible person may be entered on the ballot as well as a quotation of Article VI, Section 6 of this Constitution. Each Member shall vote for only one candidate to fill each vacancy and shall transmit the marked ballot to the Secretary-Treasurer in the manner prescribed in Article VI, Section 12.

SECTION 4. Nominating ballots, to be considered, shall be returned to the Secretary-Treasurer and be received by him not later than 8 months prior to the annual meeting. It shall then become the duty of the Secretary-Treasurer to verify the eligibility of Members who have returned ballots, remove the sealed ballots from the outer envelopes in which they were received from the Members, and forward the sealed ballots of eligible Members to the Chairman of the Committee on Nominations at least seven and one-half months prior to the annual meeting.

SECTION 5. The President, if he deems it necessary, shall appoint two or more tellers to assist the Committee on Nominations. Such tellers shall not be officers of the Institute nor members of the Council.

SECTION 6. Three or more persons assembled from among the members of the Committee on Nominations and the tellers, at least two of which assembled persons shall be members of the Committee, shall open the envelopes containing the nominating ballots and, from the names of the Members who are nominated by a number of ballots equal to at least three per cent of the total number of Members, shall prepare an election ballot which carries out, to the greatest extent possible in compatibility with the nomination returns, the policies of representation and eligibility as set forth in Article IV, Section 5, Article V, Section 1, and in this section. No person shall be a candidate for more than one elective post in the Institute on any election ballot. Before placing the name of any nominee on the election ballot as a candidate, the Chairman of the Committee on Nominations or the Secretary-Treasurer shall obtain the nominee's acceptance of the nomination. In case one Member shall receive the required number of votes for nomination for each of two or more offices, the nominee shall be tendered candidacy for his choice of these offices, except that if, in the opinion of the Committee on Nominations, there is valid reason under provision of this Constitution or of the By-Laws of the Institute, for excluding the nominee as a candidate for any of the said offices, such office shall be omitted from the proffer of candidacy.

SECTION 7. At least two but not more than three names shall be placed on the election ballot as candidates for each of the offices to be filled in the election, the names selected being those receiving the largest numbers of nominating ballots for the respective offices, unless contrary provision, in lieu of modifying circumstances, is made herein. There shall be at least one and one-half times as many candidates for Councilor at Large as there are vacancies to be filled.

SECTION 8. When in the judgment of the Committee on Nominations, the best interests of the Institute will be served or the provisions of Article VI, Section 7 will be met only by adding the name of a Member to the list of candidates for any office or for Councilor at Large on the election ballot in addition to those names which have received nominations from three or more per cent of the Members, the Committee on Nominations is authorized to add such name by unanimous vote of the Committee. Should all eligible persons who shall have received the required number of nominating votes each for any office decline the nomination, the Committee on Nominations shall choose two qualified persons, who upon acceptance of the nomination, shall become candidates. Should the number of eligible persons who shall have received the required number of nominating votes each for Councilor at Large and who shall have accepted the nomination be less than one and one-half times the number of vacancies for Councilor at Large to be filled, the Committee on Nominations shall choose qualified persons, who upon acceptance of the nomination, shall increase the number of candidates to at least one and one-half times the number of vacancies to be filled. After counting and tabulating the nominating ballots the Committee shall retain and safeguard these ballots until the new officers and Councilors at Large shall have been elected and shall have taken office.

SECTION 9. After preparing the election ballot, the Chairman of the Committee on Nominations shall forward the names of the candidates for the several posts so chosen to the Secretary-Treasurer, with a duplicate copy to the President. The Secretary-Treasurer shall determine the eligibility of each nominated Member to occupy the post specified in the report of the Committee on Nominations. In any case of ineligibility, the Committee on Nominations shall substitute an eligible name to be selected insofar as possible from those whose names appeared on nomination ballots, in accordance with the provisions of Article VI, Sections 5-8.

SECTION 10. The Secretary-Treasurer shall then promptly obtain printed copies and shall send, not less than six and one-half months prior to the annual meeting, to each Member in good standing, an official election ballot which shall contain the names and short biographical sketches of candidates for each post, selected in the manner set forth in Sections 3 to 8 of this Article. Each Member in good standing shall be eligible to vote for one candidate for each office of the Institute and for one candidate to succeed each retiring Councilor at Large. Each voter shall properly signify on the ballot his choice for the various officers and Councilors at Large, and transmit it to the Secretary-Treasurer, in the manner prescribed in Article VI, Section 12.

Six months prior to the annual meeting, the President shall appoint election tellers. The Secretary-Treasurer, after having verified the eligibility of all Members who shall have returned ballots, recorded the names and removed the ballots from the outer envelopes, shall deliver the unopened ballots of eligible Members to the election tellers at such proper time and location as the President may designate. The tellers shall receive the unopened ballots and shall count the votes and report the election results to the President within two weeks after the transmission of the ballots by the Secretary-Treasurer to the tellers. The results of the election shall be announced by mail by the President to the membership at least four months prior to the annual meeting.

SECTION 11. The candidate receiving the highest number of votes among the candidates for an office on the official election ballot shall be declared elected to the office for which he was a candidate. Among the candidates for Councilor at Large, those who receive the largest numbers of votes on the official election ballot shall be declared elected to fill the places to be vacated by the retiring Councilors at Large. In the event of a tie vote for any office or for the post of Councilor at Large to be filled by the candidate who shall have received the smallest number of votes among those elected, the five Councilors at Large who are about to retire at the expiration of regular terms shall decide the election. As soon as practicable after the results of the election shall become known, the Secretary-Treasurer shall notify each person of his election to office and shall obtain from him a written acceptance of the office to which he shall have been elected.

SECTION 12. Neither the nominating ballot nor the official election ballot shall be signed or otherwise identified by the Member voting. Each of these ballots shall be enclosed and sealed in a special envelope provided for that purpose and sent to the Secretary-Treasurer in a sealed outer envelope on which the voting Member's name shall appear. Ballots not conforming to this procedure shall be declared invalid and shall be rejected.

SECTION 13. Vacancies occurring among the officers or among the Councilors at Large shall be filled by a majority vote of the Council until the next annual election, at which all vacancies among the Councilors at Large shall be filled for the unexpired terms.

ARTICLE VII

Duties of the Council

SECTION 1. The Council shall determine the policies of the Institute and direct the affairs of the Institute in such a manner as to promote the best interests of the Institute. The Council shall investigate and pass upon the qualifications of all applicants for membership; shall elect to membership in the proper classification applicants who in its judgment are properly qualified; shall fix the dates and places of annual and special meetings; and shall until the next annual election fill any vacancy among the officers or among the Councilors at Large.

SECTION 2. The Council shall administer the finances of the Institute. The Council may negotiate agreements with individuals, institutions or other societies, provided that when such agreements are of major importance or when they include financial transactions involving sums in excess of an amount that will be specified in the By-Laws of the Institute they shall be subject to final ratification by the Institute at large.

SECTION 3. The Council shall empower the Secretary-Treasurer to make contracts and expenditures for goods, investments, and services required for the conduct of the Institute of Food Technologists as provided for in the annual budget and in the resolutions of the Council from time to time, provided that no unbudgeted expenditure shall be made except when the

expenditure is covered by a specific resolution of the Council, which resolution shall state the purpose or purposes for which the Secretary-Treasurer is empowered to make the expenditure.

SECTION 4. Subject to instructions from the Institute, the Council shall fix the amount of annual dues and assessments.

ARTICLE VIII

Committees

SECTION 1. A Committee on Programs shall be appointed by the President-Elect, subject to the approval of the Council. This committee shall serve during the fiscal year following that in which it shall be appointed. This committee shall have charge of the program of the annual meeting and shall study the needs of special groups in the Institute and may plan smaller meetings for groups with common problems or interests. Only Members shall be eligible to serve on this committee.

SECTION 2. A Committee on Nominations shall be appointed by the President-Elect, subject to the approval of the Council, to serve during the fiscal year following that in which it shall have been appointed. This Committee shall consist of at least three Members and its duties shall be to prepare nomination and election ballots for the annual election, as prescribed in Article VI, Sections 3-8.

SECTION 3. A Committee on Regional Sections shall be appointed by the President-Elect, subject to the approval of the Council, to serve during his term as President. The duties of this committee shall be to investigate applications for section charters and advise the Council of recommended action thereon, and to supervise the relation of regional sections to the Institute which shall include definition of the area to be included in a regional section, with recommendations for any action that may be deemed necessary.

SECTION 4. A Committee on Qualifications shall be appointed by the President-Elect, subject to the approval of the Council, to serve during his term as President. The duties of this committee shall be to investigate the qualifications of those who apply for membership in the Institute and advise the Council of recommended action thereon.

SECTION 5. When the need arises, the President or President-Elect shall be empowered to appoint a Committee on Arrangements for the annual meeting.

SECTION 6. As occasion arises, the President or the President-Elect shall be empowered by the Council to appoint such additional committees as are necessary for the best interests of the Institute.

ARTICLE IX

Application for Membership

SECTION 1. An applicant who seeks membership as a Member or an affiliate according to Article IV, Sections 2 and 3, shall be considered as a candidate for such membership when recommended, in writing, on blanks to be furnished by the Secretary-Treasurer, by three Members of the Institute to whom he is personally known.

SECTION 2. An applicant who seeks membership as an associate according to Article IV, Section 4, shall be considered nominated when recommended in writing by three Members, or by one associate and two Members of the Institute.

ARTICLE X

Election of Members of All Classes

SECTION 1. Election of candidates to membership as Members, affiliates, and associates shall be by a majority vote of the entire Council and can be made at any time either by mail or in a meeting.

SECTION 2. After a candidate shall have been elected to membership, the Secretary-Treasurer shall promptly notify him of his election, the class of membership to which he has been elected, and the amount of annual dues pertaining to that class of membership.

SECTION 3. Elected candidates shall become Members, affiliates, or associates upon notification and payment of dues within 30 days after notification of such election.

ARTICLE XI

Forfeiture of Membership

SECTION 1. Failure to pay dues within 90 days after first notification shall be cause for removal of any name from the membership list by affirmative vote of the Council provided that

an additional notification has been made more than 45 days after the first notification and not less than 20 days before the date of removal of the name from the membership list.

SECTION 2. By a unanimous vote of the Council, following a hearing which the member shall have been summoned to attend, the membership of a Member, affiliate, or associate, may be forfeited for such specific reason as the Council may deem adequate. The hearing shall be set for a time and place that are convenient for the member, if possible. If the member, after having been summoned to attend the hearing, fails to appear, the Council shall have power to act in his absence.

ARTICLE XII

Quorums

SECTION 1. Fifty Members shall constitute a quorum of the Institute for the transaction of business.

SECTION 2. At any meeting of the Council a majority of the members of the Council shall constitute a quorum for the transaction of business, and agreements by three-fourths of those present shall authorize action in all transactions except for election to membership or for election to fill a vacancy among the officers or the Councilors at Large. When, at the discretion of the President, the Council shall transact business by mail, three-fourths of the Council shall constitute a quorum, provided, that a period of 20 days shall be allowed for participation by the Council in business transactions by mail.

ARTICLE XIII

Meetings

SECTION 1. Once each year there shall be a meeting of the Institute for the presentation of papers and the transaction of business. This meeting shall be known as the annual meeting. The Council shall decide the time and place of the annual meeting.

SECTION 2. The Committee on Programs shall be authorized to project special meetings at convenient times and places for groups of members with common problems and interests, or with other societies having similar interests.

ARTICLE XIV

Regional Sections

SECTION 1. The Council is empowered to grant authority, in the form of a charter, to organizations of members of the Institute of all classifications residing in the same geographical district or region for the establishment of a regional section of the Institute when such organization of members shall petition the Council for authority to designate itself a regional section of the Institute and the Council shall have ascertained that the conditions prescribed in this Article for such authorization have been met, and further that the petitioning organization of members will agree to conduct its affairs in the manner hereinafter set forth.

Conditions for Authorizing a Regional Section

SECTION 2. The region in which members may form a regional section shall be defined as any municipality in which 25 or more members of the Institute of all classifications reside, or any larger area that the Council may approve after investigation by the Committee on Regional Sections.

SECTION 3. Authority for the establishment of a regional section shall be withheld unless the petitioning organization of members shall have had an uninterrupted continuity of existence for a sufficient length of time to satisfy the Council as to the enduring character of the petitioners' purpose; provided that this period shall be not less than one year during which the petitioning organization shall have held at least three stated meetings per year; and provided further that the officers of the petitioning organizations shall have been Members of the Institute, in good standing for a minimum of one year.

SECTION 4. When any Regional Section shall cease to function as a section of the Institute for a period of more than one year, or if it shall hold less than three meetings per year, or if its membership shall be less than 25 members of the Institute of all classifications for one year, the Council may by affirmative vote terminate the charter of such Regional Section.

Membership in Regional Sections

SECTION 5. Membership in regional sections shall include regional associates in addition to members of the Institute of all classifications—Members, affiliates, associates—provided that

the number of regional associates shall not exceed, in any regional section, 25 per cent of the total membership of the said section. Each regional section shall have power to establish the procedure through which regional associates will be received into membership in the section.

Regional Section Representation on Council

SECTION 6. Any authorized regional section of the Institute having a regional membership of not less than 25 members of the Institute of all classifications is authorized to elect one of them, who holds membership in the Institute as a Member, for each 100 members of the Institute of all classifications, or fraction thereof, to represent the section in the Council and to be designated as Section Councilor. Section Councilors shall have the same privileges, duties and responsibilities in the Council as the Councilors at Large and shall be subject to the same limitations of terms of office as Councilors at Large as set forth in Article V, Section 1. If a Section Councilor shall be unable to attend a regularly called meeting of the Council, the Executive Committee of the section shall have the authority to designate, by a majority vote of its members, an alternate Section Councilor to attend the Council meeting as a substitute for the regularly elected Section Councilor, which alternate Councilor shall, after having presented proper credentials in the form of a letter from the Secretary of the Section, have full power to function as a Section Councilor in that meeting.

Responsibilities and Authority of Regional Sections

SECTION 7. The Council, after receiving affirmative recommendation from the Committee on Regional Sections, may grant a charter from the Institute if, in the opinion of the Council, the conditions in this Article of the Constitution have been met and if the members of the petitioning organization signify by their signatures that they agree to adopt and abide by the Section By-Laws appearing in the Appendix of this Constitution, which may be changed or modified, subject to approval of the Council, in the manner therein prescribed.

ARTICLE XV

Amendments

SECTION 1. Amendments to the Constitution may be proposed at any annual meeting. If approved by the majority of the Members present, a proposed amendment shall be printed, mimeographed, or otherwise reproduced and sent to all Members of the Institute for ratification. Votes thereon shall be returned to the Secretary-Treasurer within 30 days of the date of mailing to Members in order to be counted. If the proposed amendment receives three-fourths majority approval of those voting, it shall be considered carried.

SECTION 2. By-Laws of the Institute appearing in the Appendix to this Constitution, may be amended by a majority vote of the Members at any annual meeting at which a quorum is present or by vote which is taken by mail, provided a quorum of Members participates.

APPENDIX

INSTITUTE BY-LAWS

ARTICLE I

SECTION 1. At the annual meeting of the Institute, the order of business, subject to arrangement or revision by the Committee on Programs, shall be:

(a) Reading of minutes of the previous meeting.
(b) Report of officers.
(c) Reports of committees, announcements, appointment of tellers and of new committees.
(d) General sessions for the presentation of general programs.
(e) Reports of temporary committees.
(f) Miscellaneous business.
(g) New business.
(h) Announcement of elections.
(i) Announcements.
(j) Adjournment.

SECTION 2. The Committee on Programs may, on advice from the Council, invite nonmember authors whose work is of exceptional merit or of exceptional importance, to present at a general session of the annual meeting, a general discussion of some topic of wide interest to the members.

SECTION 3. The Committee on Programs may, upon advice of the Council, arrange such programs or special discussions with small groups that may have a common interest and may invite non-member authors to lead the discussion.

SECTION 4. Rules contained in "Pocket Manual of Rules of Order" by Henry M. Roberts shall determine the parliamentary practices of the Institute in all cases to which it applies, when they are not inconsistent with the Constitution or By-Laws of the Institute.

SECTION 5. The fiscal year shall be decided by the Council.

REGIONAL SECTION BY-LAWS

ARTICLE I

Name, Location, and Object

SECTION 1. The name of this organization shall be "The..... Section of the Institute of Food Technologists."

SECTION 2. The headquarters of the section shall be located in the City of.....

.....

SECTION 3. The objects of the section shall be: (1) the advancement of the profession of food technology and the maintenance of high professional standards among its members; (2) the formation of closer professional and personal relations among the members; (3) the furtherance of the aims and purposes of the Institute of Food Technologists; and (4) the promotion of cordial and helpful relations with the faculties and students of nearby institutions giving courses in food technology.

ARTICLE II

Obligations to the Institute

SECTION 1. The activities of the section and its members are subject to the provision of the Constitution of the Institute of Food Technologists.

SECTION 2. The section shall not have authority to act for or in the name of the Institute of Food Technologists and shall not incur any financial obligations in the name of the Institute except when authorized by the Council of the Institute of Food Technologists.

SECTION 3. The fiscal year for the section shall be decided by the Executive Committee.

ARTICLE III

Membership

SECTION 1. The membership of the section shall include, subject to requirements hereinafter specifically stipulated, all members, independent of classification, of the Institute of Food Technologists residing in or engaged in the district covered by the section, as approved by the Council of the Institute, viz..... Interested persons who have no form of membership in the Institute shall become regional associates upon election by a three-fourths majority vote of the Executive Committee, provided that in no event shall the number of non-members of the Institute exceed 25 per cent of the number of those holding membership in the Institute in the section.

SECTION 2. Persons whose vocations are related directly to food production, processing, or distribution in such a way as to require knowledge of food technology and in such a way as to indicate the likelihood of a growing interest in food technology on the part of these persons are eligible to be regional associates.

ARTICLE IV

Dues

SECTION 1. The dues for members of the section shall be.....dollar(s) per year, payable on.....; all regulations regarding payment of dues shall be made by the Executive Committee of the section.

SECTION 2. Members joining the section six months after the beginning of the fiscal year shall pay one-half the annual dues for that year.

ARTICLE V

Officers and Section Councilors

SECTION 1. Officers of the section shall be Chairman, Vice-Chairman, Secretary, and Treasurer. The section may, if it so elects, combine into one the offices of Secretary and

Treasurer. Only Members of the Institute shall be eligible to be officers. No Member shall be eligible to hold more than one office at any one time.

SECTION 2. The Chairman, or in his absence, the Vice-Chairman, or in his absence the Treasurer, or in his absence, the Secretary shall preside at all meetings of the Section.

SECTION 3. The Secretary shall keep a record of the proceedings of the section. He shall, under direction of the Chairman, issue notices of meetings to the members. Immediately after the annual meeting, the Secretary shall make a report to the Secretary-Treasurer of the Institute, outlining the activities of the section during the year.

SECTION 4. The Treasurer shall be charged with the collection and disbursement of funds as authorized by the Executive Committee. At the first section meeting of each fiscal year the Treasurer shall present a financial report to the section membership.

SECTION 5. The Secretary and the Treasurer, or the Secretary-Treasurer, shall be eligible for re-election within limitation. No other officers shall be eligible to succeed themselves.

SECTION 6. The section, when eligible as provided in Article XIV, Section 6 of the Constitution of the Institute, shall have one or more representatives in the Institute Council, designated as Section Councilors. Members of the Institute shall be eligible to be Section Councilors, and the holding of a section office shall not disqualify a Member from being a Section Councilor.

ARTICLE VI

Committees

SECTION 1. There shall be an Executive Committee consisting of the officers of the section, the retiring Chairman, the Section Councilors, and four other members who shall be members of the Institute in any classification, to be elected as provided in Article VIII. Two of the four elected members of the Executive Committee shall be elected each year to serve a two year term of office. The retiring Chairman of the section shall automatically remain a member of the Excutive Committee for one year. The Vice-Chairman, Secretary, and Treasurer of the section shall be members of the Executive Committee for one year, or during their tenure of office and until their successors shall have taken office. Section Councilors shall be members of the Executive Committee for two years or until their successors shall have taken office. If any officer or the retiring Chairman of the section be elected a Section Councilor he shall have only one vote as a member of the Executive Committee. This committee shall meet at the call of the Chairman of the section, who shall serve also as Chairman of the Executive Committee. The Executive Committee shall be charged with transaction of the business of the section. The minutes of its meetings shall be read with the minutes of the section at the regular meetings of the section.

SECTION 2. There shall be a Program Committee of which the Vice-Chairman of the section shall serve as Chairman. The committee shall be appointed by the Chairman of the section with approval of the Executive Committee.

SECTION 3. There shall be a Budget Committee appointed by the Chairman of the section with approval of Executive Committee. The Section Treasurer shall serve as Chairman of the Budget Committee. The Committee shall prepare and submit its report for the coming year during the fourth quarter of each fiscal year.

SECTION 4. There shall be an Auditing Committee appointed by the Chairman of the section with the approval of the Executive Committee. This committee shall make a full audit of the Treasurer's record books, bank deposits and withdrawals for the previous fiscal year and make report of its findings not later than during the first quarter of each fiscal year.

SECTION 5. Such other committees as may be required shall be appointed by the Chairman with the approval of the Executive Committee.

ARTICLE VII

Meetings

SECTION 1. There shall be at least three meetings of the section each year, one of which shall be the annual meeting to be held preceding the annual meeting of the Institute, and as near to that meeting as possible. The Executive Committee shall determine the date and place of meetings.

SECTION 2. The Secretary shall send a notice of each meeting to members at least one week in advance of such meeting.

SECTION 3. A quorum shall consist of such per cent of the enrolled members of the section as its Executive Committee may decide.

ARTICLE VIII

Elections

SECTION 1. All officers of the section, Section Councilors, and the members of the Executive Committee shall be elected by ballot at the annual meeting and shall take office at the first meeting following the annual meeting at which they shall have been elected. Election shall be by a majority vote of those present at the annual meeting or by mailed ballots which shall have been received by the Secretary of the section prior to the beginning of the business session of the annual meeting. Each mailed ballot, when received by the Secretary, shall be sealed in a special envelope provided for that purpose which shall have been mailed in an outer sealed envelope on which the voting member's name shall appear. Immediately after the annual election, the Secretary of the section shall forward the names of the newly elected officers to the President and Secretary-Treasurer of the Institute.

SECTION 2. Promptly upon receipt of a section charter and every second year thereafter at its annual meeting the section shall elect a representative to the Council of the Institute for every 100 members or fraction thereof (provided there shall be at least 25 members before the first representative is elected), as provided in Article V, Section 1, and Article XIV, Section 6 of the Constitution of the Institute, to be designated as Section Councilor; provided that where membership in the section shall include more than 100 members as provided in Article XIV, Section 6 of the Constitution of the Institute, thereby authorizing more than one Councilor for the section, their elections shall be staggered so that the terms of office of Section Councilors shall expire in alternate years.

SECTION 3. Should a vacancy occur in any office or in representation to the Council, the Executive Committee shall by a majority vote appoint some member of the section, who is a member of the Institute in an eligible classification to fill the unexpired term.

ARTICLE IX

Order of Business

SECTION 1. The order of business of the section at meetings, unless changed at the discretion of the Chairman, shall be as follows: Reading of minutes, reports of officers and committees, unfinished business, new business, election of officers (at last meeting preceding the annual meeting of the Institute), adjournment.

ARTICLE X

Amendment of By-Laws

SECTION 1. Subject to approval of the Council, these By-Laws may be amended at any meeting by an affirmative vote of not less than two-thirds of the members of the section voting (or by letter ballot under regulations approved by the Executive Committee).

Originally proposed July 1, 1937; Revised May 25, 1940; Revised Dec. 18, 1940 by Committee; Revised Jan. 21, 1941 by Council; Revised Feb. 2, 1941 by Committee; Revised Apr. 30, 1941 by Committee; Revised May 8, 1941 by Committee; Revised June 2, 1941 by Chairman of the Committee on Constitution; Recommended for adoption June 14, 1941 by Council; Adopted June 16, 1941 by Institute; Revised March 28, 1944 by Committee; Recommended for adoption May 28, 1944 by Council; Adopted May 30, 1944 at Business Session of the Institute subject to mail vote; Adopted July 15, 1944 by mail vote; Revised Sept. 9, 1946 by Committee; Recommended for adoption June 1, 1947 by Council; Adopted Feb. 13, 1948 by mail vote.

Selected Abstracts

ANALYTICAL METHODS

100H. Color test for identification of glucose.

HESTRIN, S., AND MAGER, J. *Anal. Chem., 17,* 1032-35, Dec. 1947.

A color test is described whereby glucose can be detected in a small sample to the exclusion of many other sugars, among them the aldohexoses, galactose and mannose. The test is based on the fact that glucose, unlike the other sugars examined, forms no color when heated only with phosphoric acid under the conditions described but forms a characteristic lilac color when pyrocatechol is subsequently added to the reaction system. The test is inapplicable if other sugars are present. Nitrites and tryptophane interfere. The test is valid in the presence of other amino acids as well as certain proteins (gelatin and edestin). Purines and polyhydric alcohols do not interfere. A numerical method is proposed for distinguishing between the colors produced with pyrocatechol by glucose, galactose, and mannose. Examples are given of application to oligosaccharides and polyaldohexosides.

101H. Electrometric method for the estimation of sucrose and reducing sugars.

COALSTAD, S. E. *Analyst 72,* 409-10, Sept. 1947.

The dead-stop titration method of Foulk and Bawden (*J. Am. Chem. Soc.*, 1926, *48,* 2044) has been adapted to the volumetric estimation of reducing sugars with Fehlings solution without preliminary classification of the sugar solutions. Irregularities in the titration of impure sugar solutions, such as molasses, raw sugar and juice were overcome by adding 0.1 to 0.4 g. of purified charcoal to the reaction mixture.

102H. Some notes on the carbohydrates in artichokes.

WIKLUND, O. *Socker Handlingar, 3, 8,* 125-36 (1947).

The carbohydrates of the artichokes, which only contain quite small amounts of reducing sugar, can be almost quantitatively precipitated with barium hydroxide and ethanol at room temperature. A study of the optical activity of these carbohydrates and their ability to diffuse through a cellophane wall shows that they probably contain at least one glucose-containing component having a molecular weight higher than that of saccharose but lower than that of inulin.

103H. The determination of tocopherol in natural fats and oils.

LUNDBORG, N. *Arkiv. Kemi, Mineral, Geol.* A21, No. 2, 1-13 (1945); *J. Am. Oil Chem. Soc., 24,* 347, Oct. 1947.

By the method of Emmerie and Engel and the saponification method of Allport the contents of tocopherol in mg. per 100 g. of oil or fat were found to be: soybean 23.4, peanut 11.2, rape 9.0, butter 3.0 or less, and margarine 8.9. Tocopherol was detected in skim milk, and the maximum content was 42 mg. per 100 ml.

104H. A study of the determination of peroxides in fats.

VOLZ, F. E., AND GORTNER, W. A. *J. Am. Oil Chem. Soc., 24,* 417-20, Dec. 1947.

The Kokatnur-Jelling method as modified by Lingenfelter for the determination of peroxides in animal fat has been found to agree satisfactorily with other methods now in use. The modified method involves a microtitration in a homogeneous medium (isopropanol) and has the additional advantages of being both simple and rapid. A statistical analysis of the peroxide values shows that the reaction time and temperature and the sample size must be standardized to obtain reproducible and reliable results. Close adherence to reaction specifications such as 5 min. at 80° C. or 7 min. at 75° C. is necessary. Three minutes is too short a reaction time. The individual fat sample should contain no more than 50 microequivalents of peroxygen to avoid depression of the peroxide value.

105H. Microchemical detection of vanillin and bourbonal.

RUTTEN, A. M. G. *Chem. Weekblad, 42,* 95 (1946); *Analyst, 12,* 449, Oct. 1947.

One drop of the solution to be tested is added to a drop of 0.05% aqueous solution of sulfanilic acid on a microscope slide, and the liquid allowed to dry in air. Bourbonal gives yellow starry rosettes and "wheatsheaf" bundles; vanillin forms thin branching crystals. Esters, aldehydes, phenols, and coloring matter do not interfere. For essences containing glycerol, or vanilla sugar, the material is extracted with a small amount of light petroleum, a drop of sulfanilic acid solution is added and a few drops of 96% alcohol, and allowed to evaporate on a watch glass. The reaction occurs between two molecules of sulfanilic acid and one of the aldehydic compound. The coloration disappears, reversibly,

above 80° C. Photographs of the crystalline forms are given.

106H. Some applications of fluorimetry in vitamin analysis.

KODICEK, E. *Analyst 72,* 385-93, Sept. 1947.

A critical survey of some flourimetric methods for the estimation of vitamin B_1, riboflavin N-methyl nicotinamide, and nicotinamide is presented. A table of fluorescence of vitamins and related compounds under specified conditions is included.

107H. The chemical estimation of nicotinic acid in cereals and other foods.

JAMES, E. M., NORRIS, F. W., AND WOKES, F. *Analyst 72,* 327-36 (1947).

Difficulties have been encountered in the chemical assay of nicotinic acid in cereals. A study, using the Spekker photoelectric absorptiometer, has been made of the following factors which might affect results. (a) Choice of and method of using aromatic amine, including p-amino acetophenone in alcoholic or aqueous solution, procaine, aniline and metol. (b) Procedures for removing or correcting for the presence of interfering substances by decolorization or adsorption techniques or by the use of different blanks. (c) Instrumental errors. A chemical method has been devised which has given satisfactory reproducibility and agreement with microbiological results on a wide variety of cereal products.

108H. Spectrophotometric and colorimetric determination of nicotinic acid and its derivatives in urine.

KOKOVIKHINA, K. I. *Biokhimiia 11,* 63-70 (1946); *Biol. Abst., 21,* 1093, No. 11316, May, 1947.

Urine is concentrated, hydrolyzed with NaOH, then with HCl, decolorized with $ZnSO_4$ and NaOH, and the reaction of Konig (addition of BrCN, followed by metol) applied. The red color is determined with a spectrophotometer at 4662A or colorimetrically. If the alkaline hydrolysis is omitted, only nicotinuric acid, nicotinic acid and its amide are determined, the remainder representing N-methyl derivatives.

109H. Stearic acid for combating foam formation, especially in the Kjeldahl nitrogen determination.

HADORN, H. *Mitt. Gebiete Lebensm. Hyg. 38,* 46-7 (1947); *J. Am. Oil Chem. Soc., 24,* 346, Oct. 1947.

Stearic acid has been used previously to prevent foam formation in distillations of protein hydrolyzates. Its effect is based on the formation of a monomolecular film on the surface of the water which decreases the surface tension. While a fraction of a mg. is sufficient to prevent foam formation in distillations, about 5-10 mg. are needed in the Kjeldahl N determination.

110H. Determination of micro quantities of citric acid in biological fluids.

NATELSON, S., LUGOVOY, J. K., AND PINCUS, J. B. *J. Biol. Chem., 170,* 597-606, Oct. 1947.

A method is described for the determination of citric acid in blood, plasma, serum and urine. The method is based upon conversion of the citric acid to pentabromoacetone and measurement of the color formed between this compound and sodium sulfide using a spectrophotometer. Citric acid in amounts of 2 to 60 γ in 1 ml. of solution can be determined with an accuracy of 5%.

111H. A rapid qualitative test for added iron in flour.

PRINGLE, W. J. S. *Analyst 72,* 393-4, Sept. 1947.

The test depends upon the formation of a mauve iron lake with alizarin (1:2-dihydroxyanthraquinone). Manganese also forms a lake with the reagent, but the natural manganese, iron and aluminum contents of the flour either do not react with the alizarin under the conditions of the test or only react to a limited degree, so that the effect of these natural flour constituents is negligible.

112H. Colorimetric determination of iron and manganese in foods.

KNIPHORST, L. C. E. *Chem. Weekblad, 42,* 311-16 (1946); *Analyst, 72,* 446, Oct. 1947.

Iron was determined in foods, after wet combustion, by means of sulfosalicylic acid. Phosphates, up to 4000 parts of phosphorus pentoxide to one part of iron do not interfere. In the presence of calcium and magnesium salts, large quantities of ammonium salts are necessary to prevent the precipitation of calcium phosphate or of magnesium hydroxide. Manganese gives a brownish-yellow color with the reagent, but does not interfere if the ratio of manganese to iron does not exceed 10 to 1, and the color is matched within one hour.

113H. Polarographic determination of lead in foodstuffs.

JONES, F. R., AND BRASHER, D. M. *Analyst, 72,* 423-27, Oct. 1947.

A polarographic method has been developed for the determination of lead in foodstuffs. It is simple, convenient and does not require preliminary separation of the lead;

the conditions of electrolysis are made such that trace metals (Fe, Sn, Zn, As, Cu) do not interfere with the lead wave.

114H. Colorimetric method of determining the hardness of water.

DRATSCHEV, S. M. *Zavod. Lab., 11,* 46-48 (1945); *Analyst, 72,* 460, Oct. 1947.

Tropaeolin 00, which gives difficultly-soluble, colored compounds with magnesium and calcium salts, may be used for the colorimetric determination of water-hardness. Variation of pH within the range 6.5 to 8.7 does not affect the results. The method is sensitive to 0.5° of hardness and is accurate to 1 to 1.5°. Method of preparation of standards for the scale of hardness and the procedure are given.

BIOLOGICAL SCIENCES

MICROBIOLOGY

115H. A new principle of estimation of vitamin B_1 with the aid of *Phycomyces blakesleeanus.*

HAAG, E., AND DALPHIN, C. *Arch. Sci. Phys. et Nat.* (Geneva) *26; Suppl. Compt. Rend. Soc. Phys. et Hist. Nat.* (Geneva) *61* (3), 241-43 (1944); *Biol. Abst., 21,* 1093, No. 11311, May 1947.

A modification of the method of Schopfer and Jung which consists in the estimation of pyruvic acid following incubation in the presence of vitamin B_1.

116H. The relative errors of bacteriological plate counting methods.

SNYDER, T. L. *J. Bact., 54,* 641-54, Nov. 1947.

Five bacteriological plate counting methods were compared with respect to the magnitude and reliability of the counts obtained with a single organism. Although the three methods of measuring aliquots showed considerable difference in their coefficients of variation, the coefficients of variation of the counts did not differ greatly. Rolled tubes gave a significantly higher count than poured plates. Efficient spreading of the inoculum in the case of surface plating methods greatly reduced the variation encountered and gave increased counts.

117H. Relation of certain cooking procedures to staphylococcus food poisoning.

HUSSEMAN, D. L., AND TANNER, F. W. *Am. J. Public Health, 37,* 1407-14, Nov. 1947.

Using the multiple tube method, an attempt was made to establish thermal death time-temperature relationships for staphylococci in cream filling and to correlate such findings with the range and duration of temperatures attained in accepted cooking procedures for cream filling. One strain of *Staphylococcus aureus* was used as the test organism. Thermal death time determinations for the same organisms were also made at a range of temperatures, using a pH 7 phosphate buffer solution for the suspending medium. In the range of temperatures studied *Staphylococcus aureus* Strain C12069 (Dolman) was found apparently to survive for 30 minutes at 55° C. and to be destroyed in less than 3 minutes of heating at 85° C. In phosphate buffer solution, pH 7, the organism survived somewhat less stringent heat treatment. It appeared that at the conclusion of such a cooking procedure, cream filling was free of viable staphylococcus.

118H. The detection and correction of bacterial contamination of milk bottles in a bottle washer.

BRYAN, C. S., BORTREE, A. L., AND LUCAS, P. S. *J. Milk Food Tech., 10,* 319-22, Nov.-Dec. 1947.

Bacteria counts ranging from 10,000 to 94,000 per quart milk bottle were obtained on bottles from a brush type of bottle washer. A chlorination attachment reduced the bacterial count of the bottles to 30 or less.

119H. The role of enzymes in olive processing.

CRUESS, W. V. *Fruit Prod. J., 27,* 44-5, Oct. 1947.

Olive oxidase is not essential to the darkening of olives during pickling. Stem end softening is found to be caused by a pectin-destroying enzyme secreted by the blue Penicillium which grows in olive brine. Various suggestions are presented for the prevention of this mold growth.

PHYSIOLOGY

120H. Electrons as a cause of odor.

ERB, R. C. *Am. Perf., 50,* 561, Dec. 1947.

An "odorophore" is any particle of matter capable of stimulating the olfactory organs. To be an odorophore, the particle must be volatile to reach the olfactory region, must be water-soluble to penetrate the films covering this region, must be fat-soluble to reach the nerve endings, and must be oxidized or reduced by the enzymes, lactoflavins, or other agents present. The electronic activity produced by the oxidation or reduction is carried to the brain by the olfactory nerve; the brain translates this to a sensation of smell.

Differences in potential (from the oxidation or reduction) produce differences in odor. The argument is based on "hot" odor. Heated metal has an odor, and also evolves electrons. Therefore odor is due to electrons.

121H. Nose smells by radiation.

MILES, W. R., AND L. H. BECK. *Sci. N. L.*, 339, Nov. 29, 1947.

One is conscious of odor because the nose radiates heat waves, according to the latest theory. One does not smell because vapor charged with aromatic particles hits the nose and goes into solution on its moist inside lining. Smell is not a chemical sense. The radiation sent out by the organs of smell is within the infrared band of the spectrum; that is, it consists of heat waves which are in the neighborhood equivalent to a temperature range from 62.6° to 104° F.

DETERGENTS

122H. Modern synthetic detergents.

ALPERIN, S. *Soap, Perfumery, Cosmetics, 20,* 885-88 (1947); *J. Am. Oil Chem. Soc., 24,* 424, Dec. 1947.

Three types of detergents are reviewed, the fatty alcohol sulfates, the condensation products of a fatty acid molecule with amino or similar compounds, and the sulfonated alkyl-aryl compounds. The fatty alcohol sulfates may be produced by reaction of fatty acids with sodium and a low molecular alcohol, by the Bouveault-Blanc method or by the Van Andel process. Details of all are given. An outstanding characteristic of this group is the fact that they are incompatible with soap. The condensation type consists of the reaction products of oleyl chloride with the sodium salt of hydroxy ethane sulfuric acid to yield Igepon AP, with the sodium salt of methyl taurine to yield Igepon T and with the sodium salt of sarcosine to give Medialan A. Directions for producing all of these compounds along with steps involved in preparing the final product are also described. Manufacturing procedures for the alkylaryl sulfonates, Nacconol, are included.

123H. A study of the corrosion of tin plate by can washing compounds.

FINLEY, R. D., AND FOTER, M. J. *J. Milk Food Tech., 10,* 263-8, Sept.-Oct. 1947.

All of the commercial alkaline can cleaning compounds tested attacked tin plate readily. The maximum corrosion was found in the range of 0.05% to 0.20% Na_2O, equivalent to 0.27 to 0.65% NaOH. Elimination of oxygen from alkaline wash solutions seems to be the best remedy. Corrosion inhibitors, such as sodium sulfate, are beneficial. The two acid cleaners tested did not appreciably attack tin but did cause corrosion of iron.

124H. A study of the germicidal efficiency of can washing compounds.

FOTER, M. J., AND FINLEY, R. D. *J. Milk Food Tech., 10,* 257-62, Sept.-Oct. 1947.

Standard plate counts and thermophilic counts were made on milk can rinses to test the germicidal efficiency of alkaline and acid can washing compounds. At alkalinity levels of 0.05 and 0.10% as Na_2O no germicidal action was demonstrated, but at 0.15 and 0.20%, an increase was noted. In acid can washing compounds, the type of water used must be considered because the salts of hard water neutralized the acid solution.

ENGINEERING AND PLANT EQUIPMENT

125H. Production of fodder yeast.

HARRIS, E. E., HANNAN, M. L., AND MARQUARDT, R. R. *Paper Tr. J., 125,* 34, Nov. 27, 1947.

Sulphite waste liquor may be the source of carbohydrates upon which to produce a food yeast for either humans or animals. Sulphur dioxide is removed by steam stripping or by precipitation with lime. The resulting solutions are neutralized to a pH of 4 to 4.5, nutrients added, and then inoculated with a yeast of the Torula type. Sulphite waste liquor is sterile and therefore suitable for continuous propagation of yeast. One of the most serious problems is the tendency of excessive foaming. This may be overcome by the use of a mechanical device which allows the gas bubbles to break as the liquid falls down a central draft tube. Four kinds of liquor were used to propagate yeast, sulphite waste liquor which had been steam stripped to remove the sulphur dioxide, neutralized to pH 4.1 with lime, and filtered, sulphite waste liquor neutralized directly with lime to 4.1 and filtered; liquor which had been concentrated to 40% total solids; and magnesia-base sulphite waste liquor. The rates of growth in these liquors have been compared with the rate of growth in sugar solutions produced by hydrolysis of wood.

126H. Recovery of dried solubles from thin stillage.

SPANYER, J. W. *Chem. Eng. Prog. 42,* 523-26, Oct. 1947.

A method for recovering the "thin stillage" from distillery waste is discussed. The solids recovered from this waste liquor are extremely high in nutritive value for the feed-

ing of dairy cattle, beef cattle, hogs and poultry. The equipment used consists of a quadruple effect long tube verticle evaporator and three double-cylinder American dehydrating drums. Various operational problems are discussed.

127H. Abrading disc skin removing machine.

ZEUN, L. H. *Assignor to Peter Paul, Inc.* 2,428,903, Oct. 14, 1947.

A machine for removing the skin from coconuts, comprising a disc rotatable in a substantially horizontal plane and having an abrasive upper surface, means for rotating the disc, a relatively shallow casing surrounding and spaced from the periphery of the disc, the casing having a cover above the disc provided with elongated openings offset from the center of rotation of the disc to receive the curved outer surfaces of coconut segments to be skinned, each opening being bordered by a downwardly converging inclined rim or marginal portion adapted to support and guide the segment, the rims or marginal portions extending approximately to the abrasive surface of the disc, means for conducting water through the casing cover to the upper surface of the disc, and means for conducting water and abraded skin from the lower end of the casing.

FOOD PRODUCTS

CEREALS AND GRAINS

128H. Vitamin B_1 content of wheat.

SAKURAI, Y., AND HORI, H. *Bull. Inst. Phys. Chem. Research, 22,* 676-80 (1943); *Chem. Abst., 41,* 5643g, Sept. 10, 1947.

Vitamin B_1, contents of 87 brands of wheat grown in Japan, Korea, and N. China were colorimetrically determined. Average content is 28 γ, the maximum 46 γ, and minimum 14 γ/10 g. In milling, vitamin B_1 goes mostly to the flour and very little to the bran. In a wheat grain 66% of B_1 is in the endosperm, 25% in the germ, and 9% in the skin; while in a rice grain, 5% is in the endosperm, 66% in the germ, and 29% in the skin.

129H. White bread and epilepsy in animals.

SILVER, M. L., et al. *J. Am. Med. Assoc.,* 135, 757-760, Nov. 22, 1947.

White bread, produced from wheat flour bleached by the most widely used commercial agent (nitrogen trichloride), produces epilepsy and other neurologic disorders in animals. In dogs eating a nutritionally adequate diet containing 75% of "agenized" white wheat flour, clinical epilepsy develops, including typical electroencephalographic patterns, indistinguishable from human idiopathic epilepsy. "Agene" treatment of the wheat fractions, gluten, glutenin and gliadin and the nonwheat proteins, lactalbumin and casein renders them convulsant when fed to dogs. Mixtures of synthetic amino acids, and the individual amino acids cysteine and cystine, after treatment with agene, when injected intravenously into dogs on such a diet, produced seizures.

130H. Nitrogen trichloride treated, "agenized" flour.

FOOD AND NUTRITION BOARD, NATIONAL RESEARCH COUNCIL. *J. Am. Med. Assoc., 135,* 769-70, Nov. 22, 1947.

In view of the susceptibility of several mammalian species, the Board feels it unwise to contemplate the continued use of "agene" beyond the minimum period required to develop alternative processes. In the meantime there should be a reduction of the use of "agene." It should be employed only on such varieties and lots of wheat as may require it, and in all cases of its use the amount of nitrogen trichloride applied per unit weight of flour should be restricted to the minimum consistent with a product which can be used satisfactorily in bakeries.

DEHYDRATED FOODS

131H. Preservation of carotene in dehydrated vegetables.

HALVERSON, A. W., AND HART, E. B. *J. Nutr., 34,* 565-9, Nov. 1947.

The carotene content of dehydrated spinach, broccoli, and carrots was well preserved under storage at room temperature for 3 months by sealing in cardboard receptacles and adjusting the water content to 10-12%. Some internal gas pressure developed at 12.5% water content in the case of carrots and broccoli. With 8-10% water content no internal gas pressure developed but the carotene loss was greater than at the higher water level.

132H. Cost studies on dehydrating tomato wastes.

TEMPLETON, C. W. *Food Pack., 28,* 53-5, Nov. 1947.

Stokely Foods, Inc. have conducted pilot plant studies on dehydration of tomato wastes. Material was screened out of flume lines with 20 mesh scavenger screen. Material collected was cooked, dewatered with shaker screen and Louisville Press to 86% water (55% should be realized). Press cake was broken with a hammer mill and dried in

a Cleaver-Brooks concrete dryer. Two passes through the drier were required. Cost estimates from this pilot plant operation indicate a processing cost of about $32 per ton of dry material. Although they sold what was made at $65 per ton it is doubtful if the market will stay this high. Thus the plant would be useful as a disposal unit but not necessarily a money maker.

FATS AND OILS

133H. The component glycerides of soya bean oil and of soya bean oil fractions.

HILDITCH, T. P., MEARA, M. L., AND HOLMBERG, J. *J. Am. Oil Chem. Soc., 24,* 321-5, Oct. 1947.

The mixed glycerides of soya bean oil consist of nearly 60% of mono-saturated di-unsaturated glycerides and about 40% of tri-unsaturated glycerides; two polyethenoid groups (chiefly linoleic) are present in nearly 70% of the tri-glycerides, but less than 5% contains three in the same triglyceride molecule while linolenic groups occur (singly) in not much more than 25% of the soya bean glycerides. Of the soya bean oil glycerides (37%) which remain in solution in acetone at —40°, about 90% contain two polyethenoid groups and about 10% contain all three acid radicals in this form while linolenic acid is present (singly) in about 40% of the glycerides; but over 30% of this fraction still contains one saturated acyl group.

134H. Progress with the "neutral red-fat test" of Schonberg.

PANTE. *Z. Fleisch- u. Milchhyg. 54,* 71-2 (1944); *J. Am. Oil Chem. Soc., 24,* 345, Oct. 1947.

A good correlation on over 500 samples is recorded between the neutral red indicator test for rancidity of Schonberg and organoleptic tests.

135H. The neutral red-fat test of Schonberg and its suitability for veterinary food inspection.

GEBAURE, B. *Z. Fleisch- u. Milchhyg. 54,* 196-7 (1944); *J. Am. Oil Chem. Soc., 24,* 345, Oct. 1947.

The Schonberg method is considered suitable for testing fat and bacon for rancidity. The time for development of color should be about 15 mins., after which the color does not change. An unobjectionable fat yields a yellow to dark yellow reaction, orange to reddish-orange suggests beginning of decomposition, and a red reaction appears in rancid fats.

136H. Neutral red-fat test of Schonberg.

WESTPHAL. *Z. Fleisch- u. Milchhyg. 54,* 201-4, 214-18 (1944); *J. Am. Oil Chem. Soc., 24,* 345, Oct. 1947.

The neutral red test for rancidity was investigated. A yellow color in test generally indicates an unobjectionable fat and a red color indicates rancidity but no definite conclusion regarding the beginning or progress of rancidity from intermediate colors can be correlated with organoleptic tests.

137H. Value of the neutral red-fat test for judging the rancidity of lard and bacon.

SCHONBERG, F. *Z. Fleisch- u. Milchhyg. 54,* 221-2 (1944); *J. Am. Oil Chem. Soc., 24,* 345, Oct. 1947.

Schonberg answers the criticisms of Westphal. He contends that the test was submitted as a preliminary or a control procedure for lard or bacon; that the definitely good or bad can be identified and the intermediate or doubtful can be subjected to other tests, i. e., for peroxides, aldehydes, etc.

138H. Progress is made in eliminating rancidity from peanut butter.

OWEN, J. T. *Peanut J. and Nut World, 27,* 33, Dec. 1947.

The use of ascorbic acid in peanut butter retarded peroxide development in accelerated tests. However, it is pointed out that there is not always a correlation between peroxide number and organoleptic rancidity. The use of ascorbic acid in connection with the manufacture of salted nuts is briefly described.

139H. Fat and oil antioxidant.

Food Mat. Equip., 7, 5, Nov. 1947.

Use of propyl gallate, up to 0.01%, as antioxidant in edible fats and oils has been approved by U. S. D. A., and the Food and Drug Administration.

140H. Fumaric acid as an antioxidant for fats.

GLIMM, E., AND ROZDILSKYJ, M. *Fette u. Seifen, 54,* 389-91 (1944); *J. Am. Oil Chem. Soc., 24,* 388, Nov. 1947.

Fumaric acid was inactive as an antioxidant on several vegetable oils and butter. This is contrary to American reports.

141H. Inhibiting oily taste of butter by regulation of the pH.

PETERSEN, N. *Fette u. Seifen, 51,* 440 (1944); *J. Am. Oil Chem. Soc., 24,* 388, Nov. 1947.

Improvement in keeping quality of butter by buffering with the AIV-butter salts developed by Virtanen has been confirmed by tests in Sweden.

142H. Shortening having an extended plastic range.

ZIELS, N. W., AND SCHMIDT, W. H. *Assignors to Lever Brothers Co.* 2,430,596, Nov. 11, 1947.

An all-climate plastic shortening having desirable plasticity characteristics over an extremely wide temperature range, in which the shortening ingredients consist of an edible liquid glyceride oil blended with from about 17 to about 23% of a hard glyceride fat formed of glycerides of fatty acids, the fatty acid constituents of which comprise at least 92% of palmitic and stearic acids of which the palmitic acid comprises 15 to 30%, the shortening having a penetration within the range of 100 to 400 over a temperature range of 35 to 120° F.

143H. Shortening.

NORTH, G. C., ALTON, A. J., AND LITTLE, L. *Assignors to Beatrice Creamery Co.* 2,431,497, Nov. 25, 1947.

A granular shortening having a fat core, an edible hull, and a compound from the group consisting of an edible partial ester of glycerine and a higher fatty acid, and a partial ester of sorbitol and stearic acid.

144H. Shortening.

NORTH, G. C., ALTON, A. J., AND LITTLE, L. Assignors to Beatrice Creamery Co. 2,431,498, Nov. 25, 1947.

A dry powdered shortening composition which is non-greasy, free-flowing and readily water dispersable composed of finely divided discrete particles of an edible fat, each of the particles being provided with a coating including soya bean solids containing protein and phospholipoids in their natural intimate relation, the protein forming a protective surface about the shortening fat and the phospholipoids being active to promote substantially instant rupture and solubility of the protein envelope to free the shortening fat and finely distribute the fat in the baking operation.

FISH AND SEAFOOD

145H. What effects do cooking time and packaging have on frozen boiled shrimp?

LEWIS, H. *Food Freezing, 3,* 48-9, Nov. 1947.

The most satisfactory products were obtained using the following procedures: peeled shrimp were boiled 5 to 10 minutes in a solution containing 5% of their weight of salt; unpeeled shrimp were boiled 10 to 20 minutes in a solution of 10% of their weight of salt. Peeled boiled shrimp were acceptable when stored not longer than 3 months, or unpeeled boiled shrimp for 6 months. Storage periods longer than this are not recommended. Six weeks was the maximum storage period for shrimp cocktail and shrimp creole. As with other frozen foods, moisture-vapor-proof containers are essential for the maintenance of high quality during the storage period.

146H. Fish filleting machine.

SAVRDA, C. M. *Assignor to The Atlantic Coast Fisheries Co.* 2,431,893, Dec. 2, 1947.

A fish filleting machine having a pair of oppositely disposed ribbing knives, which are substantially parallel at the forward portion and thereafter gradually diverge outwardly and upwardly from the forward portion, and means to feed thereover a fish having an incision in its belly side and with its tail leading and back downward, yieldingly mounted hold-down means positioned above the ribbing knives to maintain the fish in contact with the ribbing knives and comprising a series of pairs of oppositely disposed downwardly converging plates with their respective bottom edges in substantial alignment with the cutting edge of the knife therebeneath.

FROZEN FOODS

147H. Brine freezing strawberries in tin.

ELLIS, C. F., AND WEGENER, J. B. *Food Freezing, 3,* 22, Dec. 1947.

Calcium chloride brine for freezing strawberries in cans was investigated from the probabilities of contamination of the product from brine, and with procedures for removing the brine from the cans after freezing. It was found that approximately 90 min. were required for complete solidification of the berries, when frozen in No. 10 cans immersed in brine at — 26° F. Cans filled with distilled water and immersed for 1 hr. in the brine solution showed no trace of chloride upon treatment with silver nitrate. Quality of the berries frozen by this method, observed both as frozen and defrosted, was found to be at least equal to that of berries frozen by other methods.

148H. Taste testers try frozen fruits.

Food Freezing, 3, 38, Dec. 1947.

The Food Acceptance Lab. at Stanford U. is determining consumer preference for frozen food. The women are selected for their ability to detect minor differences in food flavors and are comparing some 50 samples of frozen fruits. Scores will be analyzed by a trained statistician and psychologist. The housewife tasters must have

neither a dull taste nor too much imagination as they record their individual reactions to flavor, color, texture, and odor. To insure that their taste buds are not overworked, the women taste test only 5 to 20 minutes of each hour. More than adequate rest periods in pleasant surroundings are afforded the workers to give them a chance to get ready for the next test.

FRUIT AND FRUIT JUICES

149H. An experiment on partial concentration as a means of standardizing low-solids orange juice.

MOORE, E. L. et al. *Fruit Prod. J., 27,* 72-4, Nov. 1947.

One control and two partially concentrated juices of Florida Hamlin oranges of low solids, were put up in plain tin cans and stored at 40° and 80° F. Samples were analyzed initially, at three months, and at six months. No significant difference in retention of ascorbic acid was noted between packs at the end of storage. The quality of the juice at three months was improved by partial concentration. The control was darkened and the concentrated juices were bleached in storage at both temperatures.

150H. Ascorbic acid content of strawberry varieties and selections at Geneva, New York, in 1945.

SLATE, G. L., AND ROBINSON, W. B. *Proc. Amer. Soc. Hort. Sci. 47,* 219-23 (1946); *Biol. Abst., 21,* 973, No. 10009, April 1947.

The ascorbic acid content of 37 varieties and 220 selections of strawberries is reported. The ascorbic acid values of the varieties ranged from 41 to 81 mg. per 100 gm. fresh fruit and the values of the selections from 33 to 98 mg. Limited evidence indicates that the Beacon variety may be useful as a parent in breeding strawberries high in ascorbic acid.

MILK AND DAIRY PRODUCTS

151H. The utilization of the mineral-ion exchange principle in stabilizing evaporated milk.

JOSEPHSON, D. V., AND REEVES, C. B. *J. Dairy Sci., 30,* 737-46, Oct. 1947.

The mineral-ion exchange process using Amberlite IR-100 is capable of stabilizing evaporated milk against coagulation during sterilization at 240° F. for 15 min.

152H. The effect of feeding certain synthetic vitamins of the B complex on their content in milk and urine.

MARSH, D. C., PEARSON, P. B., AND RUPEL, I. W. *J. Dairy Sci., 30,* 867-75, Nov. 1947.

Synthetic thiamin, riboflavin, nicotinic acid and pantothenic acid, fed at a 2 g. level to dairy cows daily resulted in no significant increase in the levels in milk. The level of the vitamins depends on the breed of cow. Jersey cows have more per ml. but Holsteins have higher daily secreted in total amount. With goats there is an increase in the vitamin level in the milk when the vitamins are fed of a 2 g. level per day. There is about a 10% destruction.

PECTIN-JAMS AND JELLIES

153H. Use of polymetaphosphates and polyphosphates in the extraction of pectin and pectinic acids from citrus peel.

MCCREADY, R. M., SHEPHERD, A. D., AND MACLAY, W. D. *Fruit Prod. J., 27,* 36-9. Oct. 1947.

Lemon and orange peel were extracted with and without sodium hexametaphosphate and sodium tetraphosphate under various conditions of time, temperature, acidity, type of acid, concentration of extraction aids. Jelly units (grade x yield) were at a maximum at a pH of 2.0 or lower, and phosphates did not aid extraction under those conditions. The effectiveness of the phosphates increased with an increase of pH to 3.5. Filtration of the pectin extract was made more difficult when phosphates were used. Dry pectins or pectinic acids of low ash content were more readily prepared when sodium tetraphosphate was used. Both of the above salts were especially effective with enzymatically de-esterified pectin.

154H. New use found for pectin.

WELCH, H., HIRSH, H. L., AND TAGGART, S. R. *Sci. N. L., 52,* 210, Oct. 4, 1947.

By injecting pectin with penicillin, streptomycin and other drugs, their rates of escape from the body can be slowed, thereby reducing the number of injections of the drugs otherwise needed. Tests with laboratory animals indicate that the action of adrenalin, ephedrine, sex hormones and insulin can also be prolonged by injecting them with pectin.

155H. Gel strength measurement made more precise.

Food Mat. Equip., 7, 3, Aug. 1947.

New method developed at the National Bureau of Standards gives precise measurements of "yield value" and the resistance of the material to deformation. The method involves balancing the cohesive forces of the gel against a gradually increasing quantity of mercury, by means of a brass disc suspended in the gel by a wire attached to one

beam of an analytical balance. Precision of this method is greater than 0.5%. It can be applied to all types of gels, reversible or irreversible. Diagram and description of the apparatus accompany the article.

SUGARS, STARCHES, AND SYRUPS

156H. How to use soy albumen in making aerated candy.

DOWNS, D. E. *Manuf. Conf., 27,* 36, Nov. 1947.

A good soy albumen is standardized to produce uniform high quality results as the sole aerating agent for creams, nougats, kisses, divinity, fudge, and similar types of candy. It whips up rapidly and produces a good volume of small uniform air cells with good stand-up properties, without the necessity of adding any other whipping agents.

157H. Waxy starch granules.

SCHOPMEYER, H. H. *Assignor to American Maize-Products Co.* 2,431,512, Nov. 25, 1947.

In making a granular tapioca-like product adapted to retain the granular form on cooking with water to make a starch dessert, the method which comprises forming a mixture of regular cornstarch and waxy starch, containing 5 to 10 parts of regular cornstarch and waxy cornstarch, with water in proportion to form a mass including about 35 to 50 parts of water to 100 of total wet starch, heating the mass on a hot plate maintained at a temperature of about 220° to 350° F., vigorously stirring the mass during the heating so that the pasted starch is agglomerated into pellets, and discontinuing the heating and cooling the product when practically all of the mass has assumed the form of pellets.

158H. Chemical interactions of amino compounds and sugars. II. Methylation experiments.

WOLFROM, M. L., CAVALIERI, L. F., AND CAVALIERI, D. K. *J. Am. Chem. Soc., 69,* 2411-3, Oct. 1947.

By means of appropriately methylated derivatives it is demonstrated that: (1) sugar enolization is involved in the decomposition resulting in the formation of colored substances when aqueous solutions of D-glucose and glycine [or (dextro)-glutamic acid] are heated at a slightly alkaline reaction; (2) that the hydrogen of the amino group and the hydrogen on the carbon adjacent to the carboxyl group of glycine are together involved in this decomposition at an acid reaction (pH *ca.* 5.5), or alternatively, that the substituting methyl groups exert a steric hindrance effect; (3) the free amino group only is required for the decomposition at a slightly alkaline reaction (pH *ca.* 7.5).

NUTRITION

159H. A comparison of the utilization and acceptability of fresh and dehydrated food.

DEUEL, H. J., AND JOHNSON, R. M. *J. Nutr., 34,* 507-21, Nov. 1947.

Prolonged feeding tests with 8 male human subjects indicated that diets made from dehydrated foods may be equally as nutritious as those prepared from fresh foods.

160H. The nutritive value of canned foods.

NEILANDS, J. B., STRONG, F. M., AND ELVEHJEM, C. A. *J. Nutr., 34,* 633-43, Dec. 1947.

Samples of canned Atlantic mackerel, Atlantic sardines, tuna, salmon, Pacific mackerel, and Pacific sardines were analyzed for thiamine, riboflavin, pantothenic acid, biotin, nicotinic acid, pyridoxine, folic acid, vitamin D and vitamin A. No appreciable amount of vitamin A was found in the flesh of any of the canned fish except salmon, although small amounts were found in the oil from canned Atlantic mackerel and sardines. Thiamine and folic acid were generally low. Riboflavin, pantothenic acid and biotin were present in fair amounts. The samples proved to be good sources of nicotinic acid and pyridoxine. All species examined were good sources of vitamin D.

161H. Self selection of diet. V. Appetite for carbohydrates.

SCOTT, E. M., AND VERNEY, E. L. *J. Nutr., 34,* 401-7, Oct. 1947.

Of 4 carbohydrates tested in a self selection experiment, rats avoided lactose but accepted sucrose, starch and dextrin in various degrees. The appetites for various carbohydrates was independent of appetite for casein, inversely proportional to fat intake, independent of nutritional significance (except lactose), and dependent on method of offering choice.

162H. Self selection of diet. VI. The nature of appetites for B vitamins.

SCOTT, E. M., AND VERNEY, E. L. *J. Nutr., 34,* 471-80, Nov. 1947.

In rat experiments, the appetites for thiamine, riboflavin and pyridoxine shown by animals previously fed diets deficient, respectively, in these vitamins are learned, probably as a result of beneficial experience. It is suggested deficient animals continue to eat

the vitamin containing diets for two reasons: (1) a habit is set up involving an association of a feeling of well-being with some characteristic of the diet; (2) a stimulus to eat the diet, presumably the derived feeling of well-being, persists over a considerable length of time.

163H. The thiamine and riboflavin content of whole wheat, nonenriched and enriched flours and of breads made therefrom.

GUERRANT, N. B., AND FARDIG, O. B. *J. Nutr., 34,* 523-42, Nov. 1947.

Using young rats it was found that flour enriched in accordance with the present formula, is definitely superior to nonenriched flour with respect to thiamine and riboflavin and is somewhat superior to whole wheat. The amount of thiamine contributed by ground whole wheat and by enriched flour when fed as 30% of the diet, is only slightly less than that required for optimal growth. The amount of riboflavin contributed is definitely insufficient. The enriched flour contained more riboflavin than the original wheat. Breads made from ground wheat and from enriched flour show good retention of thiamine and riboflavin. Dark bread and milk bread were found to be definitely inferior to breads made from ground whole wheat or from enriched flour as sources of thiamine, and somewhat less inferior as sources of riboflavin.

164H. The potency of the U. S. P. reference standard for vitamin D.

DASLER, W., BAUER, C. D., AND VAN NOSTRAND, M. *J. Lab. Clin. Med., 32,* 1251-3, Oct. 1947.

It is recommended that the present U. S. reference standard for vitamin D be evaluated again and that pure, crystalline vitamin D_3 be adopted as the reference standard.

165H. The protein requirements of the adult rat in terms of the protein contained in egg, milk and soy flour.

BRICKER, M. L., AND MITCHELL, H. H. *J. Nutr., 34,* 491-505, Nov. 1947.

Ten adult male rats were fed 2 dietary levels of milk and soy flour proteins and 3 dietary levels of egg protein; all of the former and 2 of the latter were associated with negative N balances. The linear relationship between truly absorbed N and N balance was described by regression equations fitted to the data by the method of least squares. The amount of truly absorbed N (corrected for metabolic N in feces) required for N equilibrium was computed from these regression equations to be 2.78 mg. of egg N, 3.18 mg. of milk N, and 5.48 mg. of soy flour N per cal. of basal heat. The biological values indicated by these regression equations are 99 for whole egg N, 86 for milk N and 49 for soy flour N.

166H. Peas, supplemented with wheat germ or corn germ, as a source of protein for growth.

BEESON, W. M., LEHRER, W. P., AND WOODS, E. *J. Nutr., 34,* 587-93, Nov. 1947.

Wheat germ and corn germ compare favorably with egg protein when used as sole source of protein. As a supplement for dried Alaska peas, wheat germ in equal proportions or as 25% wheat germ to 25% cooked peas had as good a growth promoting value as peas supplemented with 0.3% dl-methionine. Corn germ, fed in equal proportions with peas, produced as good results as the methionine diet but was not as efficient as methionine when used as 25% of the mixture. Neither product as 12.5% to 87.5% peas gave as good results as 0.3% dl-methionine added to peas. Under the conditions of the experiment, the wheat germ product used was a better supplement for peas than the corn germ.

167H. The comparative biological availabilities of ferrous sulfate iron and ferric orthophosphate iron in enriched bread.

BLUMBERG, H., AND ARNOLD, A. *J. Nutr., 34,* 272-87, Oct. 1947.

On the basis of hemoglobin regeneration in anemic rats, ferrous sulfate iron was 4 to 5 times as available as ferric orthophosphate when fed in enriched bread at 4 widely spaced levels. Ferric chloride at 2 levels was equal to ferrous sulfate.

168H. The nutrition of rainbow trout. II. Further studies with purified rations.

MCLAREN, B. A. et al. *Arch. Biochem., 15,* 179-185, Nov. 1947.

Evidence is presented that a purified diet of dextrin, casein, crab meal, salts IV, $CaCO_3$, cod liver oil, corn oil, plus crystalline B vitamins and ascorbic acid, meets the nutritional requirements of fingerling trout.

169H. The folic acid requirement of turkey poults on a purified diet.

RUSSELL, W. C., TAYLOR, M. W., AND DERBY, J. V. *J. Nutr., 34,* 621-32, Dec. 1947.

The folic acid requirement for normal growth of turkey poults on a purified ration is 2.0 mg. per kilo of feed. At 25% and 43% protein levels of the purified ration 2.0 mg. of folic acid per kilo of feed is required to

prevent cerrical paralysis. At this level of folic acid, feathering was normal on the 43% protein level but subnormal on the 25% protein level.

170H. The effects of caloric restriction on skeletal growth.

HANDLER, P., BAYLING, G. J., AND FOLLIS, R. H. F. *J. Nutr., 34,* 677-89, Dec. 1947.

In young rats rate of skeletal growth was roughly proportional to the rate of general body growth when caloric restriction was the limiting growth factor. Restriction of caloric intake to about one-half of that of *ad lib.* fed control animals, while ensuring adequate supply of all other nutrients, resulted in complete cessation of both skeletal and generalized body growth. In larger, not quite completely grown rats, caloric restriction, sufficient to cause a loss of 40% of their initial body weight only slightly decreased the rate of skeletal growth.

The plasma concentration of calcium was normal in all animals, while that of inorganic phosphate was below normal in the young caloric-restricted animals but not in the older ones. Caloric restriction in young rats, older rats and parathyroidectomized rats resulted in markedly elevated plasma alkaline phosphatase activity.

171H. Malnutrition prevalent.

SANDSTEAD, H. R., AND OSBORNE, E. S. *Sci. N. L., 52,* 246, Oct. 18, 1947.

In a survey of some 25,000 persons, including school children, occupational groups and families conducted by the U. S. Public Health Service, it has been found that vitamin deficiency diseases, anemia, goiter, and rickets constitute a major health problem in at least 4 areas in the United States—Southwest, Mid-Atlantic, New England and North Central.

PHYSICAL CHEMISTRY

172H. A new method of measuring relative humidity.

LICHTGARN, F. *Instruments, 20,* 336-38 (1947).

A chemically inert electrical response method which is stable and remains in calibration over long periods of time, and which gives rapid response from 0 to 100% R. H. (linear from 35-95%) is described. The element is pressed from a mixture of a finely divided absorbing conductor and insulator such as an intimate mixture of powdered iron, graphite, and underfired clay. The sensing element is not yet available commercially.

173H. Heat degradation of gelatin.

AMES, W. M. *J. Soc. Chem. Ind., 66,* 279-84, Aug. 1947.

A study has been made of the degradation of gelatin prepared by the alkaline process and the acid process. The effect of heat at different pH's and concentrations are shown. A theory is developed explaining the relation of the two kinds of gelatin to collagen.

News of the Institute

FOOD TECHNOLOGISTS HOLD EIGHTH ANNUAL CONFERENCE

The Eighth Annual conference of the Institute of Food Technologists held in Philadelphia on June 6-10 brought the largest attendance the Institute has ever drawn. There were 1012 registered delegates from thirty-six states and four continents.

Food experts and executives of food processing firms from all branches of the industry heard a wide variety of papers by experts in many fields of food technology.

Two outstanding features of the convention were marked by the presentation of the Nicholas Appert award, an annual presentation of the Chicago, Illinois section

George J. Hucker, former president of the Institute of Food Technologists, extends congratulations to H. C. Diehl, Director and Secretary of the Refrigeration Research Foundation Inc., the Institute's newly elected president, at its Eighth Annual Conference held in Philadelphia June 6-10, 1948.

of the Institute, to Dr. Conrad A. Elvehjem. Dr. Elvehjem is professor of agricultural chemistry at the University of Wisconsin and has received many honors of distinction for his outstanding work in the field of nutrition and food technology. The Institute of Food Technologists initiated a new award at the traditional luncheon held on Wednesday, June 9, by the presentation of the Stephen M. Babcock award to Dr. Fred C. Blanck for his life-long work and many valuable contributions to the various branches of food technology.

Over two hundred of the delegates availed themselves of a carefully planned group of plant visitations to several of the large food processing plants in and around

Philadelphia. Of particular interest was an all day trip to Campbell Soup Company in Camden, New Jersey, and to the Seabrook Farms in Bridgeton, New Jersey, one of the largest food freezing plants in the world.

Officers elected for the coming year were: President, Helmut C. Diehl, Director and Secretary of the Refrigeration Research Foundation Inc. of Berkeley, California, and Vice-President, Bernard E. Proctor, Director of Food Technology Laboratories, Massachusetts Institute of Technology, Cambridge, Massachusetts. Carl R. Fellers, Head, Department of Food Technology, University of Massachusetts, Amherst, was reelected Secretary-Treasurer.

A noteworthy feature of an elaborate program of entertainment was a boat ride on the Delaware River enjoyed by nearly eight hundred delegates and their friends. In addition to dancing and refreshments, an exciting game of Monte Carlo contributed to the congenial and informal atmosphere which continued to prevail throughout the conference.

The sessions of the conference commenced with a greeting from President G. J. Hucker, Honorary Chairman James McGowan, Jr., President of Campbell Soup Company, and a welcome from Dr. Rufus S. Reeves, Director of Public Health in the City of Philadelphia. Colonel Charles S. Lawrence, commanding officer Quartermaster Food and Container Institute, Department of the Army, Chicago, Illinois, outlined a plan for mobilization of technical personnel in the event of a national emergency. Herbert N. Riley, Vice President of H. J. Heinz Company, discussed "What Food Technology has done for our business," emphasizing the need of trained scientific personnel in the successful maintenance of quality in food production. LeRoy Voris, Nutrition Research Council, Food and Nutrition Board, Washington, D. C., outlined a "Survey of Food and Nutrition Research."

Technical sessions which followed included papers on the problems of the food technologists in maintenance of quality in frozen poultry, controlled distribution of prepared foods and marketing of certified milk.

A general session included the role of agricultural research in the development of finer quality fruits and vegetables.

The technical sessions included studies in ion exchange resins, technology of pectins, sterilization by new techniques, amino acids, insect and rodent control, the use of scientific instruments in food processing and many technical developments in the preservation of foods by freezing.

Particularly popular among the delegates was a session devoted to determination of taste preferences in various types and varieties of foods. In this session, Dr. Katheryn E. Langwill of Drexel Institute of Technology disclosed results of a survey indicating that 77% of the women tested, as against 46.7% of the men, could distinguish paper treated with sweet, salt, sour and bitter solutions.

The technical experts of the meeting started off on Sunday evening with a seminar and round table discussion on "Color Changes in Foods" led by Dr. Maynard A. Joslyn of the University of California. The seminar was followed by a social get-together at which refreshments were served, greatly aiding in initiating a friendly and informal atmosphere among the delegates.

Members of the Philadelphia section of the 1948 conference committee included E. Everett Meschter, American Preserve Company, General Chairman; Edward F. Kohman, Campbell Soup Company, Vice-Chairman, and Earl Graham, Crown Can Company, Secretary. Mrs. G. T. Reich as chairman of the ladies entertainment committee arranged an interesting and novel program for the ladies who attended the conference. It included a fashion show and luncheon, sightseeing and an afternoon trip to Longwood Gardens on the duPont estate.

HONORS RECEIVED

Dr. Conrad A. Elvehjem, Professor of Biochemistry at the University of Wisconsin, has been awarded the Nicholas Appert Medal for 1948. The award was made at the Annual Conference of I. F. T. in Philadelphia in June.

Dr. Roy C. Newton, of Swift & Company, has been awarded the honor scroll of the American Institute of Chemists this year.

Dr. Fred C. Blanck, of the Mellon Institute Research Staff and Past President of I. F. T., has been selected as the recipient of the 1948 Food Technology Award of the Nutrition Foundation.

Dr. Aksel G. Olsen, of the General Foods Corporation and retiring Chairman of the New York Section of I. F. T., spent two weeks in Sweden, Denmark, and Norway in the spring, at the invitation of the Royal Swedish Academy of Engineering Sciences and the Swedish State Council of Research. In Stockholm, Oslo, Bergen, and Copenhagen, he addressed groups on the subject "Recent Advances in Food Technology." Dr. Olsen reports that wonderful hospitality was extended to him and that he found considerable interest in Scandinavia in the Institute of Food Technologists.

These honors are well deserved, and to the recipients go the congratulations of the Institute of Food Technologists, together with wishes for many more successful years in professional work of a high order.

COMMITTEE CHAIRMEN, 1948-49

The roster of chairmen of regular and special committees of the Institute is as follows:

Budget and Finance—P. K. Bates
Roster of Scientific Personnel—F. C. Blanck
Selection of Institute Insignia and Membership Certificate—L. V. Burton
Institute Organization—Wm. Campbell
Regional Sections—J. L. Heid
Education and Curriculum—M. E. Highlands
Nominations of the Institute—Paul Logue
Selective Service Deferment (tentative title)—J. H. Nair
Publications—W. D. Pheteplace
Publicity—A. N. Prater
Student Groups—C. L. Smith
Constitution of the Institute—E. S. Stateler
Membership of the Institute—R. V. Wilson
Program—E. M. Mrak
Membership Qualifications—E. M. Chace

Regional Section News

CHICAGO SECTION

At the March 15 meeting of the Chicago Section, Dr. E. E. Meschter of the Philadelphia Section gave a short talk describing the plans for the 8th Annual I. F. T. Conference at Philadelphia.

At a meeting of the Executive Committee on April 14, the following appointments were made:

J. M. Jackson and G. E. Brissey were appointed as delegate and alternate to represent the Section on the Chicago Technical Societies Council from June 1948 to June 1950.

L. R. Hedrick was appointed I. F. T. Section Councilor to fill a vacancy for the remainder of 1948.

The jurors for the Nicholas Appert Award were appointed for the 1948-51 term.

On April 19, Mr. R. C. Pollock, Executive Director of the National Live Stock and Meat Board, addressed the Chicago Section on "The Contribution of Research in Evaluating the Nutritional Importance of a Food Product." His talk dealt with the various fields of research that have been explored with the object of planning a

sound program for production of meat as a wholesome nutritional item of the daily diet.

On May 17, Dr. John H. Hetrick, Research Supervisor, Dean Milk Company, gave a talk on "Recent Technological Advances in the Dairy Industry." In March he presented this subject at the I. F. T.-Dairy Bacteriologists Panel at the Chicago Technical Conference and Production Show.

At the Chicago Technical Societies Council Conference, held on March 23, the Chicago Section of I. F. T. participated as co-sponsor of the panel on "The Technologists at Work in the Food Capital of the World." At this same conference, Colonel Charles S. Lawrence, Commanding Officer of the Quartermaster Food and Container Institute, spoke on "The Contribution of Technology to Food Production with Special Reference to Chicago and Adjacent Areas." Other members of the Chicago Section who attended this conference were O. G. Braun, J. M. Jackson, W. E. Pearce, and R. Royce.

A By-Laws Committee was appointed consisting of Robert M. Schaffner (Chairman), Harold S. Mitchell, and Gordon E. Carlson. This Committee reviewed the present by-laws of the Chicago Section and submitted suggestions for changes to the members. The objects of the suggested changes are to make the by-laws conform to the new I. F. T. constitution, to have the Section's fiscal year conform to that of the National Institute, and to bring the by-laws up to date with new practices and customs. The details are given in the May issue of *The Vitalizer*. The suggested revisions were unanimously adopted at a meeting of the Chicago Section on May 17.

It is planned to distribute approximately 1,000 copies of the June issue of *The Vitalizer* at the 1948 National Conference. The Philadelphia Section kindly offered to make this distribution at the Registration Desk.

The April issue of *The Vitalizer* contains a new feature, a column on "Current Patents" by Albert I. Kegan, a contributing editor to *The Vitalizer* and a Chicago patent lawyer specializing in food processing and products patents. In this column Mr. Kegan plans to discuss important food processing patents from the standpoint of the art involved. Mr. Kegan has served on various committees of the Chicago Section, most recently as Chairman of the Professional Status and Public Relations Committee, which established the Chicago Speakers' Bureau.

Members outside the Chicago Section can now subscribe to *The Vitalizer* at a cost of $1.00 per year. Inquiries should be addressed to *The Vitalizer*, Room 512A, 308 West Washington Street, Chicago 6, Illinois.

Mr. A. I. Kegan spoke on March 11 to the Quick Frozen Food Association of Chicago on "Food Laws and Regulations of Special Interest to the Frozen Food Industry."

Dr. John M. Ramsbottom, of Swift & Company, addressed the Cincinnati Section of the American Association of Refrigerating Engineers, at Dayton, Ohio, on March 15, on "Refrigeration as Related to the Ultimate Quality of Meat." Dr. Ramsbottom also addressed a subsequent meeting of the Chicago Section of the same society on this subject.

Milton E. Parker, a Past Chairman of the Chicago Section, became Professor of Food Technology in charge of the food technology program at the Illinois Institute of Technology, as of April 1, 1948.

C. C. Zeigler, also a Past Chairman of the Chicago Section, spent part of the winter at Sebring, Florida.

Dr. Marvin J. Hall has been appointed Director of Research for Kraft Foods Company, succeeding Dr. Lloyd K. Riggs, who is now Nutrition Research Director of National Dairy Products Corporation Research Laboratories.

Members of the Chicago Section who attended the National Frozen Food Industry Convention and Exposition held in Chicago on March 15-18 included O. G. Braun, N. H. Coonen, J. F. Feaster, L. G. Germain, G. L. Hays, J. M. Jackson, D. B. Moyer, W. E. Pearce, H. L. Roberts, R. Royce, P. Sognefest, H. R. Todd, and I. E. Wheaton.

Mr. and Mrs. Theodore R. Steiskal announce the birth of a son, Carl Francis, on March 4. Mr. Steiskal is on the staff of the Manufacturing Research Department of Libby, McNeill & Libby.

Joseph W. Hanley has been appointed head of the New Products Development Department of Libby, McNeill & Libby. Succeeding Mr. Hanley is Matthew E. Hein, who will supervise quality control in the season plants in the Eastern Division.

Frank C. Caple, formerly of the Morrison, Illinois Milk Laboratory, has been transferred to the General Laboratory of Libby, McNeill & Libby, at Blue Island.

Dr. B. W. Beadle, formerly of the Research Laboratories of the American Meat Institute Foundation, has assumed new duties as Director of the George W. Gooch Laboratories, Ltd., of Los Angeles, California.

Dr. Raymond E. Kirk, Dean of the Graduate School and Head of the Chemistry Department of the Polytechnic Institute, Brooklyn, New York, was the guest of Dr. Lloyd A. Hall at the April 19 meeting of the Chicago Section.

Dr. W. J. Shannon addressed the Wisconsin Dietetic Association on April 9 on the topic "The Importance of Federal Meat Inspection to the Consumer."

A. E. Mudra presented several papers on canning technology at the Food Processors School at Ohio State University during the period March 20 through March 29.

Dr. B. S. Clark spoke before the faculty of the College of Agriculture at the University of Illinois on April 9 on the topic "Some Applications of Science in Food Packaging."

Dr. J. M. Jackson presented a paper on "Sterilization of Foods" at the April meeting of the American Chemical Society in Chicago. Mr. H. A. Benjamin was co-author of this paper. At the same meeting Dr. Jackson also read a paper entitled "The Frozen Food Industry" written by Mr. Clifford F. Evers of the National Association of Frozen Food Packers, who was unable to attend the meeting.

David B. Moyer of the American Can Company was recently transferred to Tampa, Florida.

Dr. O. R. Alexander announces the arrival of a son, Jarel R., March 26.

Dr. Randall Royce attended the Food & Drug Administration hearing on standards for frozen fruits in Washington, D. C.

Victor Conquest presented a paper "On the Permanence of Your Job as a Chemist" before the American Chemical Society in April.

V. Del Giudice, R. Hanson, and B. M. Shinn presented a paper on "The Incidence of Putrefactive Anaerobes in Pork" before the Laboratory Section, Illinois Public Health Association meeting in Chicago, on April 16.

William Schwab gave a talk, sponsored by the I. F. T. Speakers' Bureau, before the South Shore Community Club on "Meat Packers and Chemurgy."

W. H. Childs is the author of an article on "Peanut Butter in Confectionery," which has been published in the April issue of *The Manufacturing Confectioner*.

J. D. MacKay, formerly of Armour & Company, is now with the Flex Vac Division, Standard Cap & Seal Corp., Chicago.

William K. Davis, a graduate of the University of Wisconsin with a Bachelor's Degree in Soils, has been appointed by the Agricultural Research Section of Libby,

McNeill & Libby to their Wisconsin Area Agricultural Research Department, with headquarters at Lake Mills, Wisconsin.

T. Soloski, Head of the Cereal and Baked Products Branch, Quartermaster Food & Container Institute, attended meetings in Washington, D. C., for establishing standards relative to the use of potassium bromate in flour. He also made an extensive trip to Texas and California in connection with research and production problems for parboiled rice, canned bread, and active dried yeast.

R. L. Graf, of the Animal Products Branch of the Quartermaster Food & Container Institute, recently made an eastern trip to New England, New York, and Washington in connection with research and production activities relative to cured, smoked, and canned meats.

Dr. Joseph R. Wagner, formerly head of the Nutritional Research Section of Libby, McNeill & Libby General Laboratory at Blue Island, has joined the staff of the Quartermaster Food & Container Institute as Chief of the Fruits and Vegetables Branch, Food Development Division.

Collins F. Fuller, formerly associated with the Forest Products Laboratory at Madison, Wisconsin, has joined the staff of the Quartermaster Food & Container Institute as Chief of the Container Analysis Division, Container Laboratories.

Mr. A. P. Voaden has recently joined the staff of the Wixon Spice Company, Chicago.

The membership was pleased to welcome Past Chairman C. C. Zeigler at the May meeting. This was Mr. Zeigler's first attendance since his prolonged illness.

At the first annual meeting of the Associates, Quartermaster Food & Container Institute, held at Dayton, Ohio, on May 17 and 18, a number of Chicago Section members were elected to office, as follows:

Vice Chairman, Board of Directors	Dr. R. C. Newton, Swift & Co.
President	Dr. B. S. Clark, American Can Company
Treasurer	Victor Conquest, Armour & Company
Secretary	Col. R. A. Isker

These, together with Mr. T. M. Rector of the New York Section who was elected Vice President, are the first regular officers of the Associates, because the organization has operated under an interim committee until this time.

Dr. F. C. Koch, one of the country's outstanding biochemists, died on January 26, 1948. For years Dr. Koch was Head of the Department of Biological Chemistry at the University of Chicago and subsequently Head of the Biochemical Laboratories of Armour and Company.

Dr. Robert E. Buck, formerly of the Quartermaster Food & Container Institute, Chicago, has been appointed head of the Process and Products Research Laboratory, Research and Quality Control Division of the H. J. Heinz Co.

John S. Goldsmith has been promoted to Vice President of John H. Dulany & Son, Inc.

NORTHERN CALIFORNIA SECTION

Dr. George F. Stewart, of Iowa State College, was the dinner speaker at the February 26 meeting of the Northern California Section. Dr. Stewart gave an illustrated talk on "Research in Dried Eggs." His talk was followed by a lively discussion period, during which cakes and custards prepared from dried eggs held in storage 18 months were sampled. Dr. Helen L. Hanson, of the Western Regional Research Laboratory, prepared the products for tasting. At this same meeting Mr. George Gilman of the Chicago Quartermaster Corps gave a brief talk on the implications of the dried egg research program on other sponsored projects.

On March 11, Mr. and Mrs. E. E. Jacobs were hosts to the Executive Committee, Committee Chairmen, and members of the *Hornblower* staff in their home, serving a delicious buffet supper to the following: Pancoast, Mitchell, Junk, Richert, Hile, Sorber, Grossi, Mrak, Richardson, Morgan, Cliff Smith, Mackinney, Leonard, and McKirahan.

At the April 15 meeting of the Northern California Section in Berkeley, a motion picture entitled "Hired Hands" showing the electrification of California agricultural industries was presented by the Pacific Gas and Electric Company. Mr. Walter Howell of that company discussed the recent water and power shortages in California. Door prizes were a feature of this meeting.

At the business meeting following the above program, members were invited to express their opinion on the following topics:

1. "What is the position of the Northern California Section regarding the proposal of having a full time paid National Executive Secretary for the Institute instead of the present elective office?" (Moderator, E. E. Jacobs.)
2. "What is the position of the Northern California Section in regard to the proposal that its fiscal year and annual meeting be changed to conform to the national system, which is from July 1 to June 30, with a summer meeting?" (Moderator, E. L. Mitchell.)
3. "Shall student members form separate Food Technology Clubs in conjunction with educational institutions or shall the Northern California Section actively promote attendance of students at its regular sessions? Shall the Membership Committee actively seek affiliate members for the Section?" (Moderator, W. V. Cruess.)

The object of these discussions was to give members an opportunity to express their opinions on matters concerning the Institute and especially on matters likely to be discussed at the next Council Meeting, so that Section Councilors would know how to proceed when attending national meetings. There was so much discussion on these subjects that other matters scheduled for discussion had to be omitted because of the lateness of the hour.

On June 24, Dr. Franz Goetzl of the Permanente Foundation will address the Section on the "Physiology of Hunger and Appetite." A discussion led by Dr. Samuel Lepkovsky will follow the talk.

The annual joint meeting of the Northern and Southern California Sections will be held at the University of California, Los Angeles, on October 22 and 23.

Since January 1 there have been four meetings of the Executive Committee, at which 61 applications for membership in the Northern California Section of I. F. T. have been approved. Most of these new members have also applied for national membership. As of May 1, this Section has 369 members, of which over 300 are also national members. The Membership Committee, under the chairmanship of Edwin L. Mitchell (Richmond-Chase Co., San Jose) is to be congratulated on its successful efforts in increasing the Section's membership.

As a result of its increased membership, the Northern California Section has become entitled to another member on the National Council. Mr. Hugh T. Griswold, Director of the Packaging Research Division, Pacific Coast Branch, Owens-Illinois Glass Company, has been appointed the new (fourth) Section Councilor.

Active preparations are being made for the 1949 National Meeting of I. F. T. in San Francisco, and the dates selected are July 10 to July 14, 1949. Co-Chairmen Ray Junk and Hugh Griswold have tentatively appointed chairmen of various committees to carry on this work, as follows:

Arrangements	Paul Sharp	Field Trips	Harry Pancoast
Transportation	Ernie Jacobs	Budget	Alan Richardson
Publicity	Walt Richert	Publications	Hal Jahn
Program	Emil Mrak	Entertainment	Deacon Williams
Exhibits	Tom Bruce	Ladies' Program	Irene McCarthy

The first general announcement of the 1949 National Meeting will appear in the June issue of the *Hornblower*. This issue will be distributed to those attending the Philadelphia Conference and will also be mailed to the entire national membership. Plans are being developed for special cars or special trains to bring members and their families from the East. Those attending will be given an opportunity to buy a "Packaged Trip" including a visit to Glacier Park, Bonneville Dam, Seattle, a 5-day stay in San Francisco, Yosemite Valley, a view of Hollywood and Los Angeles, and either the Grand Canyon or Carlsbad Caves.

Plans for compiling a directory of the food industries located in Northern California have been approved. Such a directory will be of benefit to the Employment Committee in placing members and to the Membership Committee in locating prospective members.

Chairman Gordon Mackinney of the Employment Committee has conceived the idea of a complete Food Manufacturers' Directory of Technological Personnel, and the work is under way. The plan is to get an estimate from management on employment requirements for each of the next five years and to establish a directory of industry members for solicitation by the Membership Committee.

The Reception Committee, of which Paul Hile is Chairman, has the following members: Richard Brown, American Can Co.; Dr. Stewart and B. G. Grossi, Gerber Products Co.

R. N. Berry, Associate Editor of the *Hornblower* and Laboratory Director for Clapp's Baby Foods, San Jose, has had to undergo an operation but has now recuperated.

This past winter C. R. Havighorst, Associate Editor of Food Industries, had a 6-week trip to parts of the United States, including Texas.

John R. Matchett and Daniel G. Sorber, of the Western Regional Research Laboratory, attended the annual convention of the National Frozen Food Association in Chicago, March 15-18.

Reese H. Vaughn, Professor of Food Technology at the University of California, delivered several lectures at the first Food Processors' School at Ohio State University, Columbus. This was an intensive 2-week course in food processing, open to any one who registered before the quota was filled. Dr. H. D. Brown, Professor of Horticulture at Ohio State University, was in charge of the course.

William Rabak, of the Western Regional Research Laboratory, is Chairman of the Program Committee for the packaging show to be held in San Francisco in August. Dutch Diehl is serving with him.

Section members who will trek East for the I. F. T. meeting in Philadelphia are Emil Mrak, Maynard Joslyn, and George Marsh from the University of California, and Helen Hanson and John Matchett of the Western Regional Laboratory. In addition, Hugh Griswold, Ray Junk, and Alan Richardson will probably be present.

Professor Gordon C. Mackinney of the Division of Food Technology, University of California, recipient of a Guggenheim Fellowship, returned last February from his trip to England, where he had a very profitable sojourn.

NORTHEAST SECTION

On March 18, members of the Northeast Section met at the Ice Cream Plant of H. P. Hood & Sons in Charlestown, Mass., and were addressed by two speakers:

Dr. William S. Mueller, Assistant Research Professor, Department of Dairy Industry, University of Massachusetts. Subject: "Results of Recent Experimentation with Quaternaries as Sanitizing Agents."

Dr. Arthur C. Fay, Director of Laboratories, H. P. Hood & Sons, Boston, Mass. Subject: "Control Methods Employed in the Dairy Industry."

Following his talk, Dr. Fay arranged for the members to make a tour of the plant, at which time refreshments were served.

On May 8, Dr. Carl Fellers cordially invited the Northeast Section to a spring meeting at the University of Massachusetts, Amherst, Mass. Members met in the Goessmann Laboratory, where there was first a short business meeting for the election of officers for the 1948-49 season. At the formal meeting that followed, there were two speakers:

Dr. Larry V. Burton, Executive Secretary, Packaging Institute, New York, N. Y. Subject: "Continuous Process Development."

Dr. Charles N. Frey, The Fleischmann Laboratories, New York, N. Y. Subject: "Commercial Production of Yeast" and "Budding and Sporulation of Yeast." (Illustrated with films, which were discussed during the showing.)

The formal meeting on May 8 was followed by a campus look-around and a picnic supper in the Food Technology Laboratory for members and their guests.

Professor B. E. Proctor, of the Massachusetts Institute of Technology, presented a paper (joint with Mr. Samuel A. Goldblith) on "The Effect of High Voltage X-Rays and Cathode Rays on Vitamins. I. Niacin" at the April meeting of the American Chemical Society in Chicago and also attended the April 19 meeting of the Chicago Section of I. F. T.

At the May meeting, the following officers were elected:

Chairman: Carl R. Fellers, Department of Food Technology, University of Massachusetts, Amherst, Mass.

Vice Chairman: Robert P. Mears, Walter Baker & Co., Inc., Dorchester, Mass.

Secretary: John J. Austin, Austin Industries, Concord, Mass.

Treasurer: Loren B. Sjöstrom, Arthur D. Little, Inc., Cambridge, Mass.

National Councilor (for two years): Michel P. Vucassovich, Gorton-Pew Fisheries Co., Ltd., Gloucester, Mass.

Executive Committee: William L. Cummings, W. L. Cummings & Co., Newton Center, Mass.; Matthew E. Highlands, Maine Agricultural Experiment Station, Orono, Maine.

The hold-over members of the Executive Committee are:

William L. Campbell, Department of Food Technology, Massachusetts Institute of Technology, Cambridge, Mass.

Arthur C. Fay, H. P. Hood & Sons, Inc., Boston, Mass.

Robert S. Scull, Burnham & Morrill Co., Portland, Maine.

The hold-over National Councilor is Arthur C. Fay.

SOUTHERN CALIFORNIA

Through the cooperation of Mr. Paul Alexander, Research Representative of the American Can Company, arrangements were made for members of the Southern California Section to tour the Los Angeles plant of the American Can Company on April 21, while the plant was in action. Dinner was served on the premises by an outside caterer, and the tour started after the dinner. Following this, a motion picture in color on "The Tuna Industry" was shown.

At the April meeting, the following officers were elected for 1948-1949:

Chairman: Arthur N. Prater, Gentry, Inc., 837 North Spring St., Los Angeles 12, Cal.

Vice Chairman: Louis B. Rockland, Department of Chemistry, University of California, Los Angeles 24, Cal.

Secretary-Treasurer: Margaret Haws, Gentry, Inc., 837 North Spring St., Los Angeles 12, Cal.

Councilor: Philip K. Bates, United Rexall Drug Co., 314 West Sixth St., Los Angeles, Cal.

Executive Committee: George H. Bowen, Mission Dry Corporation, 5001 S. Soto St., Los Angeles, Cal.

Raymond E. Cox, Bireley's Division, General Foods Corporation, 1127 N. Mansfield Avenue, Hollywood 38, Cal.

On May 19, in Los Angeles, members of the Section heard Dr. Emil M. Mrak of the Northern California Section and Professor of Food Technology, University of California, speak on the "Biology of Yeast with Respect to the Food Industry." Dr. Mrak's talk was illustrated with slides.

ST. LOUIS SECTION

The St. Louis Section of I. F. T. held a joint meeting on April 16 with the St. Louis Society for Quality Control and the St. Louis Section of the American Association of Cereal Chemists. At this meeting Mr. James H. Batchelor, Management Consultant and Lecturer in Industrial Engineering, Washington University, discussed "Modern Quality Control in the Food Industry."

On May 7 another joint meeting with the St. Louis Section of the American Association of Cereal Chemists was held, at which Dr. Max S. Dunn of the University of California, Los Angeles, discussed "Proteins and Amino Acids in the Food Industry."

Following the talk by Dr. Dunn, the St. Louis Section of I. F. T. held a business meeting. To conform with the wish of the Secretary of the national organization, the Executive Committee of the St. Louis Section decided to make certain changes in the business procedure of the local section. These changes, which were voted upon at this business meeting, were as follows:

1. The fiscal year of the St. Louis Section of the I. F. T. shall begin on June 1 and end on May 31 of each year, instead of coinciding with the calendar year, as has been the practice.

2. The annual meeting for election of officers of the local section shall be held in the second quarter of each year preceding the Annual Meeting of the Institute, and as near to that meeting as possible.

3. The officers elected at each annual meeting of the local section shall take office immediately after the Annual Meeting of the Institute.

4. The annual dues for members of the local section, irrespective of membership classification, shall be $1.00, beginning with June 1, 1948. The treasurer has been instructed to collect $0.50 for the incomplete year (Jan. 1 to May 31, 1948) from those members who have not yet paid their dues.

At this same business meeting, officers for the coming year were elected as follows:

Chairman: Alexander F. Bucholtz, Union Starch & Refining Co., Granite City, Ill.

Vice-Chairman: Frederick A. Linde, Monsanto Chemical Co., 1700 South Second St., St. Louis 4, Mo.

Secretary-Treasurer: Mary Heckman, Ralston Purina Co., 835 South 8th St., St. Louis 2, Mo.

Councilor: Eugene V. Nay, St. Louis Brewer's Yeast Corporation, 1514 North 13th St., St. Louis 6, Mo.

Executive Committee: Boris Miller, Barry-Wehmiller Machinery Co., 4660 West Florissant Ave., St. Louis 15, Mo.; Henry Peplies, Griesedieck Western Brewery Co., 1201 W. East St., Belleville, Ill.; Addison Y. Finkelnburg, Blanke-Baer Extract & Preserving Co., 3224 South Kingshighway, St. Louis, Mo.; Earl Cummings, St. Louis Health Dept., Municipal Courts Bldg., St. Louis, Mo.; Elliott H. Parks (ex officio), 2626 Solway Ave., St. Louis, Mo.

Virgil O. Wodicka, elected Chairman of the St. Louis Section at the January 1948 meeting, has left the city to become head of the Nutritional Research Department of the Chicago General Laboratory, Libby, McNeill & Libby, and has consequently resigned from the St. Louis Section.

NEW YORK SECTION

On March 17, the New York Section was addressed by Charles F. Manning of the Reynolds Metal Company, who spoke on "Application of Metal Foils to Food Packaging."

On April 14, Dr. B. L. Oser of Food Research, Inc., gave a talk to members of the Section on "A New Look at Vitamins."

On May 17 there were two speakers at the Section meeting, as follows:

L. W. Elder, of General Foods Corporation. Subject: "Taste Panels as a Research Tool in Product Development and Evaluation."

J. H. Nair, of Continental Foods, Inc. Subject: "Taste Panels for Determining Product Acceptance by Consumers."

Dr. C. A. Shillinglaw, of Coca-Cola Export Sales Co., a Section Councilor, returned in May from Santiago, Chile, where he addressed the Inter-American Association of Sanitary Engineers.

Dr. M. L. Anson, of Continental Foods, Inc., is spending two months in England and on the Continent, with Lever Brothers Unilever Ltd.

Dr. Philip P. Gray, of Wallerstein Laboratories, has been elected President of the American Society of Brewing Chemists.

Mr. T. M. Rector, of the General Foods Corporation, was elected Vice President of the Associates, Quartermaster Food & Container Institute, at the first annual meeting of the Associates held in Dayton, Ohio, on May 17 and 18.

FLORIDA SECTION

On January 5, members of the Florida Section attended a meeting in Winter Haven, Florida. Mr. H. S. Wurtel presented motion pictures on "The Production of Essential Oils as Practiced in All Parts of the World." These pictures were taken by Dr. Ernest Guenther of Fritzsche Brothers, Inc.

On January 13, in Orlando, Florida, Dr. Harry G. Miller, Biochemist for Proctor and Gamble Company, gave an interesting discussion on "Nutrition, Past and Present." He also discussed a few of the problems in the production of detergents.

On May 4, in Tampa, Florida, Mr. Vernon Praschan, Chemical Engineer with Clinton Industries, discussed the "Problems Encountered in Manufacturing Corn Products."

WESTERN NEW YORK SECTION

The annual spring meeting of the Western New York Section was held on April 17 in Buffalo. The afternoon program was as follows:

1. Frank Mitchell, of Spencer Kellogg, Buffalo. Subject: "Soy Bean Products."
2. S. E. Smith, of Birds Eye-Snider Division, General Foods, Albion, New York. Subject: "Bacteriological Aspects of Frozen Foods."
3. Symposium—"Some Color Problems in Food Research."
   (a) Introduction—Primary and Secondary Colors in Foods—Z. I. Kertesz.
   (b) Color, Its Definition and Measurement—W. B. Robinson.
   (c) Color Changes in Fruit Juices—C. S. Pederson.
   (d) Color Changes in Strawberry Preserves—E. Sondheim.
   (e) Color of Maple Syrup—K. C. Holgate.
   (f) Summary and Conclusions—Z. I. Kertesz.

Following a short business meeting and a dinner, Mr. William Moss addressed the members on "Curious Customs in Foreign Lands." Mr. Moss has spent several years in Europe and is widely traveled.

The next meeting of this Section will be in October 1948, at Syracuse, New York, at which time election of officers will take place.

GREAT LAKES SECTION

The spring meeting of the Great Lakes Section was held on April 23 in the beautiful building of the Engineering Society of Detroit. Three papers were delivered at the afternoon session and one following the evening dinner.

Dr. J. K. Gunther, Research Director of the Central Soya Company, Decatur, Indiana, spoke on the "Use of Soya Products in the Technical Development of Food Products." He reviewed the development of soy bean production and utilization, the impact of soya products on the food situation, and the properties and uses of oils, lecithin, and protein.

Mr. T. J. Otterbach, of the Corn Products Company, Chicago, Ill., discussed "Starch and Its Application to the Food Industry." He covered, in a brief presentation, the sources of starch, the methods of extracting starch from corn, the place of starch in the food industry, and the uses for starch.

Mr. C. E. Morris, of Armour & Company, Chicago, read a comprehensive paper entitled "Edible Fats: Their Manufacture and Uses." This paper was supplemented by slides showing methods of extracting and processing animal and vegetable fats.

Dr. George Garnatz, Director of the Kroger Food Foundation of Cincinnati, Ohio, gave the after-dinner talk on "Some Applications of Technology to Food." He discussed procedures used in making bread and tenderizing meat, illustrated laboratory techniques employed in making objective tests for quality, and showed the group some samples of products resulting from varied procedures. This talk was both humorous and educational.

At the April meeting the Section elected officers who will assume their respective duties at the beginning of the next fiscal year, June 1. They are as follows:

Chairman: Mr. Ray B. Wakefield, Gerber Products Co., Fremont, Michigan.
Vice Chairman: Dr. Roy E. Marshall, Michigan State College, East Lansing, Michigan.
Secretary: Mr. James C. Sanford, Basic Food Materials, Inc., Vermilion, Ohio.
Treasurer: Mr. Lewis J. Minor, Huron Milling Co., Harbor Beach, Michigan.
Executive Committee: Miss Edna Mae McIntosh, Gerber Products Co., Fremont, Michigan; Mr. Harry O. Way, H. O. Way Laboratory Service, 308 Western Reserve Bldg., Cleveland, Ohio.
Section Councilor: Dr. Fred W. Fabian, Michigan State College, East Lansing, Michigan.

The hold-over members of the Executive Committee are:

Dr. James J. Gunther, Central Soya Co., Inc., 622 Washington St., Decatur, Indiana.
Mr. Robert B. Marshall, H. J. Heinz Co. of Canada, Ltd., 25 Oak Street, Leamington, Ont.

One of the meetings of the next year will be in Battle Creek, Michigan. The other two will be held in Detroit. Dates have not been set, but they will be held in November, January, and April.

Dr. Roy E. Marshall attended the April 19 meeting of the Chicago Section, as he was in Chicago to present a paper on "Control of Quality in Apple Juice" before the American Chemical Society.

Dr. Fred W. Fabian, of Michigan State College and one of the founders and first Chairman of the Great Lakes Section, presented a paper on "Quality Control of Pickles and Pickle Products" at the April meeting of the American Chemical Society in Chicago and also attended the April 19 meeting of the Chicago Section of I. F. T.

PHILADELPHIA SECTION

On March 18, the Philadelphia Section met at the Campbell Soup Company in Camden, New Jersey, where a seminar was held on "Size Separation."

On April 9, Dr. Chester D. Dahle, Professor of Dairy Manufacturing, Pennsylvania State College, spoke to the Section on "Dairy Products Investigations."

At the meeting on May 14, the Institute's President, George J. Hucker of the New York Agricultural Experiment Station at Geneva, gave a talk on the subject of "Quaternary Ammonium Compounds."

MARYLAND SECTION

On March 12, the Maryland Section heard a talk by Dr. Amihud Kramer, of the University of Maryland, on "Objective Methods in Determining Quality in Foods."

At the meeting on April 9, the Section was addressed by Dr. S. L. Goldheim, Director of Production and Quality Control, United Distillers of America. His topic was "Manufacture of Distilled Spirits."

On May 14, members of the Section visited the University of Maryland, where they were shown the cooperative work of the University with the food industry in Maryland. The speaker at the May meeting was Dr. W. B. Kenp, Head of the Department of Agronomy, University of Maryland. His subject matter was "Progress in Research at the University."

PUGET SOUND SECTION

On April 23, a meeting was held at Johnson Hall, University of Washington campus. Dr. W. L. Mallmann, Professor of Bacteriology and Public Health, Michigan State College, addressed the group on the subject "Use of Sanitizers in the Food Industry." Dr. Mallmann discussed types and effectiveness of various detergents, disinfectants, and bactericides now available for use in food plants, with particular reference to the dairy industry. Following his address, there was considerable open discussion of this subject.

On May 13, the final spring meeting of the Puget Sound Section was held, also at Johnson Hall. Mr. C. T. Townsend, National Canners Association, San Francisco, addressed the group on the subject "Bacteriology as Applied to the Food Packaging Industry." Mr. Townsend pointed out that plant equipment speedup, food ingredients such as sugar and starch, and the conservation of water necessary in some sections of the country have caused problems in bacterial spoilage. Chlorination of cooling water following processing of canned foods, methods used for establishment of safe processes for canned food products, and new canning procedures such as the so-called pre-sterilization methods were discussed.

After the open discussion following Mr. Townsend's address, election of officers for the 1948-49 tenure was held. The officers elected are:

Chairman: C. W. Anderson.

Vice-Chairman: H. C. Douglas, University of Washington, 402 Johnson Hall, Seattle 5, Washington.

Secretary: F. P. Owens, Laucks Laboratories, Inc., 1008 Western Ave., Seattle 4, Washington.

Treasurer: A. J. King, Fisher Flouring Mills Co., Harbor Island, Seattle 4, Washington.

Section Councilor: W. L. Haley, Fisher Flouring Mills Co., West Waterway, Seattle 4, Washington.

FLORIDA SECTION

The following men were elected to office for the year 1948-1949:

Chairman: Theodore J. Kew, Dr. Phillips Canning Co., 60 W. Robinson Ave., Orlando, Fla.
Vice-Chairman: J. J. R. Bristow, Citrus Concentrates, Inc., Dunedin, Fla.
Secretary-Treasurer: George N. Pulley, Feed Products Laboratories, Inc., Lake Alfred, Fla.
Executive Committee: John L. Heid, Florida Citrus Canners Cooperative, Box 112, Lake Wales, Fla.; Wallace R. Roy, Vacuum Foods, Plymouth, Fla.

LIST OF REGIONAL SECTIONS, WITH NAMES AND ADDRESSES OF CHAIRMEN AND SECRETARIES

CHICAGO:
Chairman: E. S. Stateler, Food Industries, 520 North Michigan Ave., Chicago 11, Ill.
Secretary: John M. Jackson, American Can Company, Maywood, Ill.

NORTHERN CALIFORNIA:
Chairman: Harry M. Pancoast, Food Machinery Corp., San Jose 5, Cal.
Secretary: Ernest E. Jacobs, Lyons-Magnus, Inc., 2545 Sixteenth St., San Francisco 3, Cal.

NORTHEAST:
Chairman: Carl R. Fellers, Department of Food Technology, University of Massachusetts, Amherst, Mass.
Secretary: John J. Austin, Austin Industries, Concord, Mass.

SOUTHERN CALIFORNIA:
Chairman: Arthur N. Prater, Gentry, Inc., 837 North Spring St., Los Angeles 12, Cal.
Secretary: Margaret M. Haws, Gentry, Inc., 837 North Spring St., Los Angeles 12, Cal.

ST. LOUIS:
Chairman: Alexander F. Bucholtz, Union Starch & Refining Co., Granite City, Ill.
Secretary: Mary Heckman, Ralston Purina Co., 835 Soutn 8th St., St. Louis 2, Mo.

NEW YORK:
Chairman: Robert F. Light, Fleischmann Laboratories, 810 Grand Concourse, New York 51, N. Y.
Secretary: Stephen L. Galvin, Huron Milling Co., 9 Park Place, New York 7, N. Y.

FLORIDA:
Chairman: Theodore J. Kew, Dr. Phillips Canning Co., 60 W. Robinson Ave., Orlando, Fla.
Secretary: George N. Pulley, Feed Products Laboratories, Inc., Lake Alfred, Fla.

WESTERN NEW YORK:
Chairman: Frank A. Lee, New York State Agricultural Experiment Station, Geneva, N. Y.
Secretary: William S. Conway, Jr., Richardson Corp., 1069 Lyell Ave., Rochester 3, N. Y.

GREAT LAKES:
Chairman: Ray B. Wakefield, Gerber Products Co., Fremont, Mich.
Secretary: James C. Sanford, Basic Food Materials, Inc., Vermilion, Ohio.

PHILADELPHIA:
Chairman: G. V. Hallman, Campbell Soup Co., Camden, N. J.
Secretary: Katheryn E. Langwill, Drexel Institute of Technology, Philadelphia 4, Pa.

MARYLAND:
Chairman: Simon W. Arenson, Doughnut Corporation of America, Ellicott City, Md.
Secretary: Maurice Siegel, Strasburger & Siegel, 15 South Gay St., Baltimore 2, Md.

PUGET SOUND:

Chairman: C. W. Anderson.

Secretary: F. P. Owens, Laucks Laboratories, Inc., 1008 Western Ave., Seattle 4, Wash.

MOHAWK VALLEY:

Chairman: A. S. Burhans.

Secretary: L. S. Bowers.

Selected Abstracts

ANALYTICAL METHODS

174H. The determination of iron in biological material.

WOIWOD, A. J. *Biochem. J., 41,* 39-41 (1947).

A method for determining iron in biologic materials with a high phosphorus: iron ratio is described. Sample is dry ashed, the Fe precipitated as sulphide and the precipitate dissolved in acid in the presence of α, α' - dipyridyl. The red color is measured in an absorptiometer. All reactions are carried out in the crucible in which the sample has been ashed. Method has proved satisfactory with protein hydrolysates and cow's milk.

175H. A new method of estimating amino-nitrogen.

RENARD M. *Bull. Soc. Chem. Biol., 28,* 499-502 (1946); *Nutr. Abst. Revs., 17,* 44, No. 36, July 1947.

The reaction between amino-N and a mixture of HNO_3 and HCl, whereby a quantitative yield of a mixture of nitrous oxide and N was produced, was applied to the estimation of the N content of a variety of amino-acids with as little as 2 mg. of material. The reaction took place in a boiling tube immersed in a water bath at 70° C. for 20 minutes, after which the gases were blown off with a stream of N-free CO_2 and their volume was measured in a nitrometer.

176H. Loss of nitrate nitrogen caused by chlorides.

SHUEY, P. M. *Anal. Chem., 19,* 882-3, Nov. 1947.

The Kjeldahl method is likely to give significantly low results when chlorides and nitrates are present in relatively large amounts unless the nitrogen content of the gases evolved before addition of the reducing agent is determined and added to the nitrogen obtained in the usual Kjeldahl procedure. The Devarda method should be used when chlorides and nitrates are high and in the absence of cyanamide, urea, or organic material.

177H. Comparison of copper sulfate and mercuric oxide as catalyst in the determination of protein in fish meal.

POTTS, T. J. et al. *J. Assoc. Off. Agr. Chem., 30,* 648-51 (1947).

Copper sulphate is compared to mercuric oxide as a catalyst for the Kjeldahl determination of protein in fish meal. Fourteen replicates by each procedure were run on each of six samples, and 40 other samples were run in duplicate. The conclusion that mercury is more effective than copper sulfate for the type of sample investigated is inescapable.

178H. Report on fat in fish meal.

STANSBY, M. E. *J. Assoc. Off. Agr. Chem., 30,* 595-7 (1947).

Ether is reported to be an inferior solvent for fat in fish meal, extracting only 50% of the total fats. Acetone is more effective, yielding 75 to 100%, and benzene methanol is generally the best. Treatment of the residue with HCl, drying and re-extracting with ethyl ether usually increases the yield of fat no matter what solvent is initially used.

179H. The estimation of glycerol in the presence of propylene and ethylene glycols.

NEWBURGER, S. H., AND BRUENING, C. F. *J. Assoc. Off. Agr. Chem., 30,* 651-55 (1947).

A modification of the Malaprade periodate oxidation technique is described.

180H. Reductone interference in estimation of vitamin C.

MILLER, M. C. *Food Res., 12,* 343-59, Sept.-Oct. 1947.

A study of fresh and processed foods determining the extent of interference in the estimation of vitamin C when reductones and reductone-like substances are present. The formaldehyde modification of the indophenol-xylene extraction procedure of Robinson and Stotz, which corrects for the interfering action from reductones was compared with the unmodified method. No reductone interference was encountered in fresh fruits and vegetables while interference was encountered in all processed foods studies.

181H. Note on the colorimetric estimation of tryptophan.

MICHEL, R., AND SCHILLER, J. *Bull. Soc. Chim. Biol., 27,* 456-58 (1945); *Nutr. Abst. Revs., 17,* 44, No. 45, July 1947.

The estimation of tryptophan was difficult when the protein containing it was not easily soluble in alkali, or when the material was rich in carbohydrate which yielded caramelized products interfering with colorimetric estimation. These difficulties were overcome if the material was digested with 5N KOH for 2 hours at 37° C.

132H. A simplified chemical method for determination of nicotinic acid in pork products.

BOLIN, D. W., AND KELLY, E. *Food Res., 12,* 414-18 (1947).

A rapid simplified procedure is described for the determination of nicotinic acid in pork meats. The tissue is hydrolyzed with 6N HCl. The extract is clarified with charcoal, neutralized, and an aliquot taken for nicotinic acid analysis. Only one setting of the galvanometer is required for a single determination.

183H. A specific color reaction for glucuronic acid.

DISCHE, Z. *J. Biol. Chem., 171,* 725-30, Dec. 1947.

The method is based upon two different reactions: 1) a reaction of glucuronic acid with thioglycolic acid alone, and 2) a reaction involving mannose, thioglycolic acid, and glucuronic acid. The reaction permits the detection of glucuronic acid in free form or in polyuronides in the presence of an excess of other hexuronic acids. Spectrophotometric data on the colors are shown.

184H. Determination of theobromine and caffeine in cacao materials.

MOORES, R. G., AND CAMPBELL, H. A. *Anal. Chem., 20,* 40-7, Jan. 1948.

Rapid and accurate methods for the determination of theobromine and caffeine in cacao materials have been developed. The theobromine and caffeine are extracted from the plant materials by percolation with hot water in the presence of magnesium oxide, and the extract is clarified by treatment with zinc acetate-potassium ferrocyanide reagents. The alkaloids in the clarified extract are adsorbed on a column of English XL Fuller's earth and the theobromine is selectively eluted with dilute sodium hydroxide. The alkaline solution is adjusted to pH 6.4 with sulfuric acid and treated with an excess of silver nitrate, and the nitric acid formed by the reaction between theobromine and silver nitrate is titrated electrometrically with sodium hydroxide. For determination of caffeine, the clarified solution following the zinc acetate-potassium ferrocyanide treatment is made alkaline with sodium phosphate and the caffeine is selectively extracted by shaking with chloroform. The chloroform is evaporated and the caffeine is measured by a Kjeldahl nitrogen determination.

185H. Caffeine determinations.

MAES, E. ..*Mededeel. Vlaam. Chem. Ver. 9,* 152-5 (1947); *Chem. Abst. 41,* 6351a, Oct. 10, 1947.

The method of Grossfeld and Steinhoff (*Chem. Abst. 25,* 4324) requires 11 hrs.; that of Pritzker and Jungkunz (*Chem. Abst. 20,* 2546), which is simpler and quicker, is now being used in its place. The caffeine isolated from green coffee is white and pure, but with roasted coffee the results are always high because the caffeine is contaminated with oily and resinous material. This can be removed by dissolving the crude caffeine in 50 ml. of boiling H_2O; the impurities form a film adhering to the wall of the flask, and solidify on cooling. The flask is washed twice with 25-ml. portions of cold H_2O. These solutions and washings are treated with $KMnO_4$, and the analysis is completed as in the original method. The resulting caffeine is white and has the correct m.p. and N content. A number of check analyses showed that this modified method gives satisfactory results.

186H. Note on the microscopic identification of caffeine.

KEENAN, G. L. *J. Assoc. Off. Agr. Chem., 31,* 163, Feb. 1948.

Iodine-potassium iodide and ammonium sulfate are described as producing highly characteristic crystals on the microscope slide. These crystals, in addition to possessing a distinctive color, exhibit strong birefringence which aids in the identification.

BIOLOGICAL SCIENCES

BIOCHEMISTRY

187H. Structure of starch. Mode of attachment of the side-chains in amylopectin.

HALSALL, T. G. et al. *Nature, 160,* 899-900, Dec. 27, 1947.

In amylopectins studied, by far the greater proportion of the side-chain linkages (more than 75%) are of the 1:6 variety, and at most only a small proportion of them can involve either C_2 or C_3, a result which is of particular interest in connection with theories of the enzymic synthesis of amylose and amylopectin from glucose 1-phosphate.

188H. Structure of amylopectin.

MEYER, K. H., GURTLER, P., AND BERNFELD, P. *Nature, 160,* 900, Dec. 27, 1947.

A structure with irregular branches is favored over the "laminated" structures proposed by Haworth.

189H. Enzymic conversion of amylose into amylopectin.

PEAT, S., BOWRNE, E. J., AND BARKER, S. A. *Nature, 161,* 127-28, Jan. 24, 1948.

Experimental evidence has been obtained to indicate the ability of Q-enzyme to form amylopectin from amylose, through first degrading it to psuedoamylose.

190H. Conversion of corn amylopectin by barley malt enzymes.

BACK, T. M., STARK, W. H., AND VERNON, C. C. *Ind. Eng. Chem., 40,* 80-4, Jan. 1948.

Corn starch containing approximately 79% amylopectin was more readily converted to fermentable sugars and gave higher alcohol yields than did waxy maize starch composed of practically pure amylopectin. It was found possible to increase the conversion of corn amylopectin in a short time by supplying optimum conditions for the action of the malt enzymes, but the highest conversion that could be achieved in 15 min. was approximately 76%.

191H. Starches of the wrinkled and the smooth pea.

PEAT, S., BEURNE, E. J., AND NICHOLLS, M. J. *Nature, 161,* 206-7, Feb. 7, 1948.

In contrast to most of the cereal and root starches, that from one variety of wrinkled pea (Steadfast) contains less than 2% amylopectin (branched chain). It also contains much protein which appears to be an integral part of the starch, while the starch from smooth peas (66% amylopectin) appears not to be associated with the protein. Although the wrinkled pea is now regarded by botanists as the type and the smooth peas as the variation, it is probable that the reverse is true and that the wrinkled pea is the result of artificial breeding. It is suggested that the ratio of amylose to amylopectin varies with degree of maturity in seed.

MICROBIOLOGY

192H. Survival of food-poisoning staphylococci on nut meats.

SMITH, W. W., AND IBA, S. *Food Res., 12,* 400-5 (1947).

Pistachio nut meats were contaminated with large numbers of *Staphylococcus aureus* taken from agar cultures grown 48 hours at 37° C. The nuts were divided into three lots, one was stored at 4° C., one at room temperature (16-26° C.), and one at 37° C. The organisms on nut meats at 4° C. slowly die out but survive longer than 141 days. At room temperature it increases in number reaching a maximum in 9 days, then decreasing until sterility occurs in 99 days. At 37° C., the maximum count is reached in 48 hours after which there is rapid destruction.

193H. The reducing sugar content of frozen egg as an index of the bacterial content.

JOHNS, C. K. *Canadian J. Res., 26F,* 18-23, Jan. 1948.

Reducing sugar determinations have been proposed as an over-all measure of both bacteriological and chemical changes in frozen egg. When applied to commercial products, the technique recommended has been found to yield poorly reproducible results, while reducing sugar readings show no correlation with viable or microscopic counts of bacteria. Few of the bacteria isolated from commercial melange were able to ferment glucose.

194H. Method of producing citric acid.

SZUCS, J. 2,438,136, Mar. 23, 1948.

A method of producing citric acid by submerged fermentation, comprising subjecting a sugar material to the action of *Aspergillus niger* in an agitated, aqueous solution containing nutrient mineral substances and milk, and passing an oxygen-containing gas through the solution.

NUTRITION

195H. Interrelationship of vitamin D and the sex hormones in calcium and phosphorus metabolism of rats.

NORMAN, G. F., AND MITTLER, A. *Proc. Soc. Expt. Biol. & Med., 67,* 104-11, Jan. 1948.

The female sex hormone stunts growth of young animals, increases density of the bone shaft and accelerates epiphyseal closure in animals of both sexes. There is also a depressing effect on the parathyroid glands. The male sex hormone affects both sexes by stunting growth of the animal, diminishes density of bone shaft and delays epiphyseal closure and also depresses slightly the blood calcium. Male sex hormone is rachitogenic, female sex hormone is antirachitic.

196H. Further experiments on the relation of fat to economy of food utilization.

FRENCH, C. E., BLACK, A., AND SWIFT, R. W. *J. Nutr., 35,* 83-8, Jan. 1948.

Using litter-mate pairs of weanling rats it was found that decreasing the protein level from 22 to 7% in the diet did not alter the superior energy utilization of high fat diets. Increased weight gain, increased gains of body fat and energy, and decreased meat production were found when the ration contained 30% of fat rather than 2%.

197H. Nutritive value for growth of some fish proteins.

NILSON, H. W., MARTINEK, W. A., AND JACOBS, B. *Comm. Fisheries Rev. 9*, 1, July, 1947; *Comm. Fisheries Abst., 1*, 17, Jan. 1948.

Feeding studies were conducted with growing rats to determine the approximate nutritive value of proteins extracted with acetone from the edible flesh of 17 species of fish. No statistically significant differences were found in the gain in weight of groups of rats fed the various proteins. It is concluded that all proteins tested are of good nutritive quality, especially so far as balancing the average diet is concerned. The proteins tested were also found to be well digested.

198H. The value of various feeds as sources of arginine, histidine, lysine and threonine for poultry.

SCHWEIGERT, B. S. *Poultry Sci., 27*, 223-7, Mar. 1948.

The amount of arginine, histidine, lysine and threonine in various feeds has been determined by microbiological methods. The significance of the variation in the amounts of these amino acids in different feeds and different lots of the same feed is discussed. The amino acid content of two rations used in poultry feeding trials was good agreement when determined either by analysis of the rations or by calculating the amino acid content from data obtained on the different ingredients. Comparisons of the analytical values for these rations and the reported amino acid requirements for chicks and poults have been made.

199H. The glycine requirement of young poults.

KRATZER, F. H., AND WILLIAMS, D. *J. Nutr., 35*, 315-19, Mar. 10, 1948.

The smallest amount of glycine that would produce optimum growth was approx. 0.9% which is apparently lower than for the chick, and suggests that young turkeys possess greater ability to synthesize glycine than do young chicks.

200H. Rhubarb as protection for teeth.

MCCAY, C. M. *Food Home Notes*, Oct. 22, 1947; *J. Am. Diet. Assoc., 24*, 11, Jan. 1948.

Rhubarb juice mixed with lemon juice will prevent the acid in lemon juice and synthetic lemonade from dissolving the surface of the teeth. A small amount of oxalate in an acid beverage will protect teeth completely.

201H. Method of controlling the growth and fattening rate of livestock and poultry and composition used in connection therewith.

TURNER, C. W., AND REINEKE, E. P. Assignors to American Dairies Inc. 2,438,353, Mar. 23, 1948.

A method of controlling the fattening rate of livestock and poultry comprising the steps of administering to the animal and bird during a limited selected period of their life span a substance of low toxicity containing the thiourelyene radical —NH. CS. NH— in an amount equivalent to a range of 0.01% to 0.15% for each 200 lb. of feed.

ENGINEERING AND PLANT EQUIPMENT

202H. "Six-tenths factor" aids in approximating costs.

WILLIAMS, R. *Chem. Eng., 54*, 124-5, Dec. 1947.

"Six-tenths factor" for approximating cost of equipment of one size when the cost is known for a different size is discussed. Probable error involved is also indicated.

203H. Chemical engineering materials of construction.

Ind. Eng. Chem., 39, 1193-1264, Oct. 1947.

This 68 page review of the literature and summary of advances since about 1941 covers aluminum alloys, carbon and graphite, copper, and its alloys, elastomers, fibers, glass, iron, steel and its alloys, lead, tin, zinc, nickel, plastics, refractories, hard rubber, chemical stoneware, and wood. Generalizations and specific data on physical and chemical properties of many variations in each class are given.

204H. Silicone resins: Use in protective and decorative finishes.

PATTERSON, J. R. *Ind. Eng. Chem., 39*, 1376-79, Nov. 1947.

Properties of silicone resins as used in paints are discussed. Among those desirable properties are resistance to temperatures of 1000° F. for a few hours and for several hundred hours at 500° F.; superior weather resistance, low temperature flexibility, exceptional resistance to certain chemicals. Less desirable characteristics include difficulty of heat curing which must be carefully done, and present cost. Possible uses are for surfaces exposed to heat such as furnaces and exhaust stacks. With lower costs, other uses may become possible, such as automobile finishes as well as signs and farm machinery.

205H. Electronic preservation of food.

HUBER, W. *Electronics, 21*, 74-80, Mar. 1948.

Experiments indicate that foods of many varieties can be preserved over long periods,

without alteration in appearance or taste, by exposing them in their sealed containers to ultra-short-time pulsed cathode rays from a capacitron. Sterilization of drugs without decrease in potency is also possible.

FOOD PRODUCTS

BAKING AND BAKERY PRODUCTS

206H. A new biological process for the improvement of the baking quality of flours.

FABRIANI, G., AND FLICK, G. *Quad. Nutrizione, 8,* 35-79 (1941); *Nutr. Abst. Revs., 17,* 44, No. 209, July 1947.

The addition of up to 30% of raw potato juice to the flour improved the baking quality, giving a larger loaf with good external and internal appearance, keeping quality and digestibility. As the potato juice readily putrefies at normal temperatures and has to be kept on ice, it was more practical to use it as a dry powder, prepared in a machine similar to that for making milk powder. Other methods for improving baking quality are reviewed and the potato-juice method is shown to compare favorably with these. Further experiments using different quantities of potato juice and other substances, such as pyrocatechins and papain, are described. It is concluded that the beneficial action of potato juice is due to its content of substances similar to catechin compounds, acting on the oxidative enzymes in the flour, and to a diastatic enzyme which influences fermentation.

207H. Effect of soy flours on rate of staling in plain cake.

POWERS, L. B., AND SIMPSON, J. I. *Food Res., 12,* 449-60, Nov.-Dec. 1947.

A study was made of the value of different types of soy flour in retarding staling of cakes. Representative samples of low-, minimum-, and high-fat soy flours were chosen for study. By weight, approximately 15% of the total flour in the cakes was soy flour and the remainder cake flour. Each time the cakes were prepared one formula (seven cakes) was made from cake flour and from each of the three types of soy flour. After the cakes were cooled and wrapped in waxed paper they were stored in cans with tightly fitting lids. After definite storage periods cakes were judged by compressibility tests, ink imprints, and subjective judging. Three hours after baking, all of the cakes were rated subjectively as having about the same degree of freshness. By 72 hours after baking, according to the subjective ratings, the cakes made from cake flour and those made from high-fat soy flour were significantly fresher than the cakes made from the minimum-fat soy flour. However, the low-fat soy flour cakes were not significantly staler than the cake-flour product nor fresher than the minimum-fat soy flour cakes. In general, the judges felt there did not seem to be any consistent effect of soy flours on the staling process of cakes. Compressibility and ink imprints gave reproducible data. Twenty-two references.

208H. Alamalt flour.

Alabama Expt. Sta. *Food Mat. Equip., 8,* 7, Jan. 1948.

New sweet potato flour developed by Alabama Expt. Sta. is a fully cooked flour and differs in properties and uses from flour made from dehydrated sweet potatoes. It is made by drying the pulp of baked sweet potatoes and grinding. It has been found especially suitable for cakes, brown bread, cookies, biscuits, icings, pies, and may replace part of the eggs, butter, and sugar in cakes. Cakes made with alamalt hold moisture twice as well as ordinary cakes. Other uses are in pre-mixed pie bases, ice cream, and milk shakes.

CEREALS AND GRAINS

209H. New rice variety released in Arkansas.

LAVALLARD, M. L. *Rice J., 51,* 25-6, Feb. 1948.

Rexark, a cross between Rexoro and Supreme Blue Rose has a long slender grain, and is the first long grain rice to be grown in Arkansas. It is medium in maturity, and compares favorably with other long grains. It threshes easily and has light milling quality, short stiff straw, and is susceptible to black sheath and stem rot. A limited amount of seed is available this year, but larger quantities are expected next year.

210H. 1947 Rice acreage.

Rice J., 51, 38-9, Mar. 1948.

The yearly tabulation of acreage and production show long grain varieties up to 46% of the total crop, including Cal. which raises pearl almost exclusively.

211H. Quick-cooking rice and process for making same.

OZAI-DURRANI, A. K. Assignor to General Foods Corporation. 2,438,939. Apr. 6, 1948.

A quick-cooking rice product comprising dried, separate, substantially gelatinized rice grains having of the order of twice their original volume and a porous structure capable of ready hydration to individual grains having the soft, palatable character of ordi-

nary cooked rice. A process of preparing a quick-cooking rice product which comprises cooking rice in water to gelatinize the starch and cause swelling of the grains for a period sufficient to increase the moisture content of the grains to at least about 65-70% but not great enough to cause substantial damage thereto, then cooling the grains to prevent further gelatinization of the starch, and thereafter drying the swollen grains by removing moisture from their surfaces at a rate sufficiently faster than it can diffuse thereto from their interiors as to set them in their enlarged condition and produce a porous structure therein.

212H. Bleaching of wheat flour and like milled products.

INGELS, B. D. Assignor to Novadel-Agene Corp.), 2,433,611, Dec. 30, 1947.

A flour bleaching composition, comprising an organic peroxy flour-bleaching compound dissolved in carbon tetrachloride. A flour bleaching composition, comprising benzoyl peroxide dissolved in carbon tetrachloride.

213H. Canine epilepsy caused by flour bleached with nitrogen trichloride (agene). II. Role of amino acids.

SILVER, M. L., MONAHAN, E. P., AND KLEIN, J. R. *Proc. Soc. Expt. Bio. & Med., 66,* 410-11, Nov. 1947.

Convulsant seizures followed intravenous injections of agene-treated amino acid mixtures. It is believed that the toxicity may rest in altered amino acid fraction of bleached flour. Electro-encephalograms are presented to show the effect of the diet and injections.

214H. Action of nitrogen trichloride on proteins: production of toxic derivative.

VENTLEY, H. R., et al. *Nature, 161,* 126-27, Jan. 1948.

Nitrogen trichloride was reacted with several proteins and amino acids. Some proteins such as egg albumin, wheat gluten, casein and zein produced toxic derivatives while the gelatin, arachin and keratin derivatives were relatively non-toxic. It is believed that methionine contains the reactive center, specifically the $-S-CH_3$ grouping. Glutamic acid might also be considered as a reactive center. Nitrogen trichloride appears to be unique among the common flour improvers in producing these toxic derivatives from protein. Chlorine dioxide, potassium bromate, ammonium persulphate at 12 times the normal commercial dosage produced no abnormal symptoms in dogs.

215H. Production of starch from cereal grains.

MURER, H. K., AND MITCHELL, W. A. Assignors to General Foods Corp. 2,437,036, Mar. 2, 1948.

A process of producing cereal starch from unsteeped grain which comprises mixing the grain with water and subjecting it to mechanical treatment in a colloidizing apparatus, whereby the gluten is jellified and dispersed to release the starch granules, and then separating and recovering the starch.

216H. The use of DDT and 666 as insecticides against grain pests.

J. Sci. Ind. Res. (India), 4, 493-95 (1946); *Biol. Abst. Sect. J., 22,* 10, No. 2297, Jan. 1948.

Experiments have been carried out to determine the degree of persistence of the insecticidal effect of DDT and 666 in lime and chalk washes, at periods up to 4 months from the date of treatment. DDT in an oil-in-water emulsion with lime wash is rendered completely inactive. The deposit becomes ineffective within a few days of application. The degree of persistence of insecticidal effects of DDT and 666, applied as chalk wash, is good. Useful insecticidal effects persist 2 months after treatment.

217H. Fumigation of grains and other stored foods.

COTTON, R. T., AND WALKDEN, H. H. *Agri. Chem., 2,* 33-5 (1947); *Biol. Abst. Sect. J., 22,* 9, No. 2294, Jan. 1948.

Although insects are not a serious problem in grain storage in the northern states, higher summer temperatures in the south are favorable to rapid infestation. In all regions it is advisable to inspect each month if the grain reaches 70° F. and to fumigate if one or more weevils or 15 or more bran beetles are found per quart. A table of fumigants and dosages for wheat and corn in steel bins is given. Recommendations are also given for fumigation of mills and warehouses.

218H. Pest control in food plants.

ROWE, J. A. *Assoc. Food Drug Off. Quart. Bull., 12,* 3-13, Jan. 1948.

Effective rat control program comprises four basic activities: (1) Sanitation measures directed toward the elimination of conditions favorable to rats; (2) Rat-proofing measures which prevent rats from entering buildings; (3) Rat eradication measures which destroy rats within buildings and on premises, and (4) Inspection procedures to detect reinfestation and possible rat-proofing maintenance action. General methods for prevention of

insect infestation, and certain materials and methods used in control of insect infestations are also discussed.

COFFEE AND COCOA PRODUCTS

219H. Process of making coffee concentrates.

HEYMAN, W. A. Assignor to Baker Importing Company. 2,432,759, Dec. 16, 1947.

A method of producing a concentrated coffee extract containing substantially all desirable flavor and aroma constituents of coffee which comprises subjecting a ground and roasted coffee to steam in a closed chamber to extract the volatile constituents therefrom, condensing the condensable elements of the volatile constituents, absorbing the relatively non-condensable elements in a solvent, extracting with hot water the residue of ground coffee from which the volatile constituents have been removed by steam distillation, concentrating the solution of soluble coffee solids, combining the concentrated soluble coffee solids with the volatile condensables and the volatile non-condensables in solvent in substantially the following proportions: concentrated soluble coffee solids of about 36° Baume, 60 oz., solvent containing volatile relatively non-condensables, 25 oz., and volatile condensables, 44 oz.

220H. The West African cacao research institute.

VOELCKER, O. J. *Nature, 161,* 117-19, Jan. 24, 1948.

Five million dollars is to be set aside for study for cacao research in West Africa. Initial efforts are directed at pest and disease reduction. The long-term program includes fundamental work on the physiology of cacao, the breeding of improved varieties, and the evolution of technical methods of growing cacao and preparing the beans for market.

FATS AND OILS

221H. Effect of storage and acidity on the protection of vitamin A in shark-liver oil by antioxidants.

BOSE, S. M. *Current Sci. (India) 16,* 119-20 (1947); *J. Am. Oil Chem. Soc., 24,* 422, Dec. 1947.

Vitamin A in shark-liver oil was protected by the use of antioxidants. Highest protection was achieved with 0.04% isobutyl gallate and 0.02% citric acid. Stored at room temperature in dark bottles the controls lost 10% activity in one month and about 60% within 10 months, whereas the activity in protected samples was retained up to this time. However, once deterioration had started the rate of destruction was comparable to those of the controls.

222H. On the fortification of edible fat with vitamin A.

BASU, U. P., AND SEN GUPTA, S. K. *J. Am. Chem. Soc., 70,* 413, Jan. 1948.

An edible fat fortified with crystalline vitamin A acetate 0.05% ethyl gallate retained 74% of the vitamin under aeration for a period of 250 hours at 40° C. A similar fat fortified with a vitamin A concentrate lost all its vitamin potency under the same treatment.

223H. Some effects of amino acids and certain other substances on lard containing phenolic antioxidants.

CLAUSEN, F. F., LUNDBERG, W. D., AND BURR, G. O. *J. Am. Oil Chem. Soc., 24,* 403-4, Dec. 1947.

The protection factor of α-tocopherol, hydroquinone, and nordihydroguaiaretic were added to low temperature rendered lard containing various synergists, e. g. amino acids, ascorbic acid, protein hydrolysate, etc. Tables are given showing the synergistic effects of the latter compounds.

224H. Hydrocaffeic acid and esters as antioxidants.

ELDER, L. W., AND LEVENSON, H. S. Assignors to General Foods Corp. 2,437,731, Mar. 16, 1948.

A process of stabilizing fats, fatty acids, fatty acid derivatives and oils of animal and vegetable origin against oxidative deterioration which comprises adding thereto a material selected from the group consisting of hydrocaffeic acid and alkyl esters thereof.

FROZEN FOOD

225H. Firming apple slices.

HILLS, C. H., NEVIN, C. S., AND HELLER, M. E. *Fruit Prod. J., 26,* 256-62 (1947).

Calcium chloride and other soluble calcium salts improved the texture and firmness of apple slices, fresh, canned, and frozen, of 14 varieties of fresh and cold storage fruit. The concentration of the salt required varied according to variety, stage of maturity, and method of application. Slices dipped in calcium solutions were firmed only on the surface, but the calcium migrated to the center of the slices on storage.

226H. Processing frozen sliced apples with l-ascorbic acid.

BAUERNFEIND, J. C., SMITH, E. G., AND SIEMERS, G. F. *Fruit Prod. J., 27,* 68-71, Nov. 1947.

Successful use of ascorbic acid in sugar or syrup packs of sliced apples depends on the

specific processing method used. Gives detailed directions depending on the shape and thickness of the apple slices. Treatment with ascorbic acid protects fresh apple flavor without loss of solids and delays the browning action. Blanching is eliminated.

227H. The best freezing strawberry.

N. Y. State Agr. Expt. Station. *Canning Tr., 70,* 44, Jan. 5, 1948.

Fruit and food specialists have found that the Sparkle variety is one of the best strawberries for freezing purposes now grown in New York State. Details of tests made on over 300 different kinds of strawberries have just been published by the Geneva Experiment Station.

228H. Stabilization of frozen grapefruit.

NICKERSON, J. T. R. Assignor to General Foods Corporation. 2,437,752, Mar. 16, 1948.

A method of inhibiting the development of off-flavor in frozen grapefruit, which comprises treating the pulp of grapefruit with a substance selected from the group consisting of alkyl esters of caffeic acid of less than seven carbon atoms in the alkyl radical, hydrocaffeic acid, and alkyl esters of hydrocaffeic acid of less than eleven carbon atoms in the alkyl radical, and thereafter freezing the treated fruit, whereby it will be effectively stabilized against off-flavor development during freezing and subsequent frozen storage.

229H. Process for concentrating by freezing liquid fruit juice.

MALCOLM, W. E. 2,436,218, Feb. 17, 1948.

A method of concentrating fruit juice which consists in pre-cooling the substance, de-aerating the substance, passing the pre-cooled and de-aerated substance through successive freezing stations at successively lower temperatures, removing the frozen portion of the substance from the successive freezing stations and repassing the denser parts through some of the freezing stations and finally subjecting the resulting product to centrifuging action.

230H. Speed better than ice for limas.

JOSLYN, M. A. *Food Freezing, 3,* 49, Feb. 1948.

Fast handling of lima beans from field to freezing plant is a much better method of keeping them fresh than by icing them in the field. If limas are processed within 4 hours after they are vined, it is not necessary to ice them in the field. In fact, icing can even be harmful.

231H. Significance of bacteria in frozen vegetables.

PEDERSON, C. S. *Food Res., 12,* 429-38, Nov.-Dec. 1947.

Bacterial counts should not be thought of as an indication of the quality of the food but rather as an indication of handling of the food between blanching and final freezing. Very low counts are indication of properly blanched food and extreme cleanliness of equipment. Contamination from equipment will cause somewhat higher counts but the very high counts, that is, a million or more per gram, undoubtedly are the result of equipment contamination followed by too-long holding before freezing.

232H. Process of preparing fresh green vegetables.

MOULTHROP, O. L. Assignor to Western Frozen Foods Co. 2,437,859, Mar. 16, 1948.

In a process of preparing fresh green vegetables for freezing, the steps of: subjecting fresh green vegetables to the action of a forcible spray of an aqueous salt solution at a temperature of between about 100° F. and 130° F. for a period of from about 25 seconds to 60 seconds, the solution having a sodium chloride content of between about 20% and 30% by weight at 60° F., while permitting excess solution to drain from the vegetables, and then subjecting the wet vegetables to the action of steam to raise the temperature thereof to about 190° F.-210° F. within a period of less than 5 minutes, and then rapidly cooling the vegetables to inhibit cooking of the vegetables.

233H. Dehydroascorbic acid in frozen and cooked frozen vegetables.

BEDFORD, C. L., AND MCGREGOR, M. A. *Science, 107,* 251-2, Mar. 5, 1948.

Chard, spinach, peas, snap beans, and lima beans were studied. Representative samples, unscalded and scalded, were frozen and stored at 0° F. for 6 months. Twenty-five g. aliquots of the frozen-stored vegetables were cooked in 50 ml. of distilled water, cooled immediately, and the total sample blended. Reduced ascorbic acid was determined by the method of Loeffler and Ponting; dehydroascorbic acid, by the Bolin and Book modification of the Roe and Osterling method.

A significant amount of dehydroascorbic acid was found in the fresh vegetables. This was markedly decreased by scalding, but increased again during frozen-storage. Cooking the frozen vegetable almost completely destroyed the dehydroascorbic acid present. In both the scalded and cooked, frozen vegetables, the dehydroascorbic acid content

represented 12% or less of the total ascorbic acid, with the exceptions of unscalded spinach and chard, where the total ascorbic acid content was very low. The dehydroascorbic acid accounted for an appreciable part of the reduced ascorbic acid lost during frozen-storage in both scalded and unscalded vegetables. In the unscalded raw samples, the dehydroascorbic acid represented from 22 to 94% of the total ascorbic acid content, and in the scalded raw samples, 15 to 44%. However, since it is destroyed during cooking, analyzing for dehydroascorbic acid in these frozen—stored raw vegetables seems of questionable value.

234H. Onion juice concentrate joins frozen foods list.

N. Y. State Agr. Expt. Sta. *Canner, 106,* 20, April 10, 1948.

A concentrated onion juice which can be stored for as long as two years and still maintain a good flavor is the latest product of foods research at the New York State Expt. Sta., Geneva, N. Y. Devised as a use for off-grade, discolored, or blemished onions, the concentrate can be used in soups, sauces, pickles, catsup, and other food products.

235H. Storage of frozen eviscerated poultry.

Refrig. Res. Found. Bull., 48-1, Jan. 30, 1948.

Poultry may be stored for 6 months or more at 0° F. if protected against dehydration. Giblets, particularly livers are good for not more than 3 months at 0° F. A tight fitting moisture-proof package is a "must" to prevent freezer scald, dehydration, and undesirable changes in texture. Warm evisceration is desirable. Aging does not improve tenderness.

236H. Low storage temperatures keep dressed poultry good longer.

Koonz, C. H., Trelease, R. D., and Robinson, H. E. *U. S. Egg Poultry Mag., 53,* 12-13, Dec. 1947.

Poultry held at —20° F. and at —10° F. had a normal color and appearance after being in storage for a year. Birds held at 10° F. and higher temperatures looked rather dark. Freezer burn on birds stored at —20° F. and —10° F. was negligible. Chickens kept at 0° F. and at 10° F., however, showed signs of freezer burn within three months and products stored at 20° F. were slightly "burned" after two months. Peroxide values, indicating the development of rancidity, were highest in the chickens held at the highest temperatures. They increased, in birds held at all storage temperatures, as time went on. Flavor scores for both white and dark meat remained high all year on the birds held at the lowest temperatures.

237H. The petrographic microscope presents a new freezing concept.

Lebeaux, J. M. *Refrig. Eng., 54,* 531-33, Dec. 1947.

Samples of various fruits, vegetables, meat, and fish were frozen by different methods and afterwards analyzed by means of the polarizing microscope. These samples were frozen by shelf coil, dry ice, and immersion methods. These thin sections were analyzed by slowly rotating the microscope stage and noticing the successive color changes and extinctions. The parts which did not change as the stage was rotated were the unfrozen portions and cell walls. A section of shrimp frozen by immersion and also by shelf coil revealed ice crystals far greater in size than any single cell. These crystals were intracellular and exhibited no tendency whatsoever to rupture the cell walls. The only cell rupture noticed in any of the thin sections was due to rough handling of the slides during the planing operations. Peaches and apples showed numerous crystals both larger and smaller than the individual cells.

238H. Frozen baked foods.

Myer, M., and Brodie, J. B. *J. Canadian Diet Assoc., 9,* 45, Sept. 1947; *J. Am. Diet. Assoc., 24,* 50, Jan. 1948.

Due to the increasing popularity of frozen cooked foods, observations have been made on the factors affecting the quality of frozen foods. Standard recipes were developed for pies, tea biscuits, and rolls. Half of the products were baked before storing; the rest were frozen unbaked. Procedures are discussed in detail and the recipes are given. Some of the conclusions of this experiment showed the following: (a) In frozen pastry, hydrogenated vegetable shortening was superior in keeping quality to lard. (b) Frozen unbaked pies retained the characteristics of fresh pies longer than those that were frozen after baking. (c) Double-acting baking powder was superior to the single-acting when used in frozen tea biscuits. (d) Yeast rolls that were not kneaded kept in freezer storage better than rolls that were kneaded.

239H. Antioxidant effect of soybean flour in frozen pastry.

Overman, A. *Food Res., 12,* 343-65 (1947).

Peroxide values showed that fat in pastry containing soybean flour in proportions of 5, 10, 15, or 20% kept about equally well, with little difference between soy pastry stored raw or that baked prior to freezing.

240H. Dehydrofreezing.

Western Regional Research Laboratory. *Canning Tr., 70,* 61, Feb. 9, 1948.

This new method, combines the advantages of dehydration with those of quick freezing. It carries the product through the first cycle of dehydration, which removes a considerable amount of the weighty moisture, and then freezes it. Vitamins and flavor are virtually undamaged; so the treated product not only retains the fresh quality, but in some instances its original shape also.

241H. Drying of frozen materials.

LEVINSON, S. O., AND OPPENHEIMER, F. Assignors to Michael Reese Research Foundation. 2,435,503, Feb. 3, 1948.

A method of drying materials containing frozen water, comprising passing a relatively dry inert gas across the surface of the material in a drying chamber to remove water vapor about the material from contact with the surface of the frozen water whereby frozen water in said material is converted to the vapor state without being melted, subjecting the material in the chamber to radiant energy to impart heat thereto to vaporize the frozen water, subjecting the chamber and the material therein to a total pressure of less than 4mm. mercury, withdrawing moisture-laden gas from the zone, removing water from the withdrawn gas, recirculating the gas after the removal of water therefrom, and again passing the gas across the surface of the material.

242H. Frozen precooked foods.

PROCTOR, B. E., AND PHILLIPS, A. W. *Am. J. Public Health, 38,* 44-9, Jan 1948.

There exists a need for microbiological standards in the production of frozen precooked foods. Products tested varied widely in their bacterial populations; pastry products having the lowest counts and creamed fish the highest. Although storage tests at 0° F. showed a decrease in the microorganisms during the first few months, 10% of experimentally inoculated food poisoning organisms survived 0° F. storage of 6 months and were found to increase in numbers when kept at defrosting temperatures of 30°-37° C. for 6 or 8 hours. The necessity of keeping such products frozen until just before use becomes apparent. Direct microscopic examinations are suggested both during manufacture and storage since the method gives a more complete picture of both the killed and living bacteria and makes the results immediately available.

243H. Frozen meats including precooked.

VAIL, G. E. *Refrig. Res. Found., Bull.,* 48-2, 4, Feb. 20, 1948.

TRRF projects at Kansas State College are not advanced far enough for conclusions. However, indications are that the rancidity problem of precooked meats may be helped by the proper antioxidant.

FRUIT AND FRUIT JUICES

244H. Ascorbic acid in grapefruit juice, orange juice, and their blends: 1943.

SALE, J. W. et al. *J. Assoc. Off. Agr. Chem., 30,* 673-80 (1947).

Ascorbic acid losses during processing and storage of citrus juices have been studied on a large scale. This is a comprehensive report of a large part of the citrus packing industry.

245H. One moldy lemon ripens 500 others too soon.

BIALE, J. B. *Sci. N. L., 53,* 103, Feb. 14, 1948.

Lemons which are commonly kept in storage for five or six months before ripening, can ripen in as little as ten days if one moldy, ethylene-producing lemon is present in a lot of 500. This mold spoilage can be prevented by storage at lower temperatures and under an atmosphere containing only 5% of oxygen instead of the 21% in ordinary air.

246H. Slicing, cutting, and core-removing machine.

BRIDGE, E. W. 2,437,637, Mar. 9, 1948.

In a fruit slicing and coring machine; a turn-table on which the operating units are mounted, and which has openings through which fruit segments are discharged; a hinged trap-door for each opening; a stationary cam track located below the table; a cam-engaging roller on an arm on the trap-door for engaging the cam track and holding the door shut; a cutting plate on the trap-door to project through the turn-table opening; a cutting-head having cutting edges cooperating with the cutting plate and a funnel member mounted on the turn-table and encircling the opening and the cutting plate, the cutting plate having a central passage and slots or grooves radiating from the central passage to receive the edges of the cutting head; and a centering pin on the trap-door within the central passage.

MEAT, FISH AND SEA FOOD

247H. Chemical preservatives in foodstuffs.

SALTON, M. R. J., AND OHYE, D. F. *Food Pres. Quar., 7,* 10-14, March, 1947; *Comm. Fisheries Abst., 1,* 17, Jan. 1948.

Sodium nitrate is reduced to nitrite by bacterial action in the muscle of meat during curing. The nitrate "fixes" the color of the flesh. Nitrate in the curing solutions exerts a definite inhibitory effect on bacteria. Sodium nitrite also has a definite inhibitory action on bacterial growth, and has been found to be effective in retarding fish spoilage when incorporated into ices in quantities ranging from 0.1 to 0.5%. The degree of such retardation depends on the pH of the flesh of the fish, being greater in slightly acid flesh. The inhibitory effect of organic acids is due mainly to the undissociated molecule, or the anion, or both. The inhibitory effect of inorganic acids is due primarily to the pH change they produce. Acetic acid is more toxic than lactic acid to bacteria, yeasts and molds. In the presence of sugars, the opposite is true, and under such conditions citric acid is less toxic than either lactic or acetic acids. Propionic acid and its salts are good mold inhibitors.

248H. Freezing fish at sea.

LEMON, J. M., AND CARLSON, C. B. *Refrig. Eng., 54,* 527-30, Dec. 1947.

The large tonnage factory ship and trawlers equipped to fillet and freeze fish at sea will improve quality and reduce cost. Fish is either killed in catching or shortly thereafter and, as dead tissue, is subject to enzymatic breakdown which is doubled for each 10° F. increase in temperature. To duplicate the practices applied to other food products it is necessary to freeze fish immediately after they are taken from the water. Diagrams of freezing apparatus are given.

249H. Can fish be frozen aboard vessel, thawed, filleted and refrozen ashore?

STANSBY, M. E., AND DASSOW, J. *Pacific Fish., 46,* 65, Mar. 1948.

Fillets from flathead "sole" *(Hippoglossoides elassodon)* and from yellowfin "sole" *(Limanda aspera)* were prepared, packaged and frozen on the fishing grounds aboard the M. V. Alaska. Whole fish from each lot were frozen in a block the same day and glazed for storage. Eleven weeks later at the laboratory the whole fish were thawed, filleted, packaged, and frozen in the same manner as the fillets had been aboard ship. Fillets were cut from the fish immediately after sufficient thawing had taken place, and there appeared to be no additional difficulty in the operation due to the freezing process.

Organoleptic examinations of samples from both lots were made shortly after refreezing and after five and ten additional weeks of storage at 0° F. A taste panel averaging ten persons judged the cooked fillets for appearance, flavor, texture, and edibility. With both species, the texture of the refrozen fillets has been entirely satisfactory with no greater drip upon thawing than that of fillets packaged aboard ship. The refrozen fillets have been equally satisfactory in appearance and flavor. In many cases, observers have preferred the refrozen fillets on the basis of superior color and fresher flavor.

250H. The control of fillet contamination in fish plants. II. The relationship between the initial contamination and the subsequent rate of spoilage.

CASTELL, C. H. *Fisheries Res. Bd. Canada Atl.,* No. 41, 10-13, Jan. 1948.

Three sets of experiments were made. In the first, attempts were made to cut fillets from market cod so that they were entirely free from bacteria and then their keeping time determined. In the second set of experiments, graded amounts of fish-spoiling bacteria were added to sterile or almost sterile fillets to find out the relation between the numbers of bacteria and the rate of spoilage. Lastly, an attempt was made to determine to what extent the contamination from the fish slime, cutting tables, skinning tables, ice, lessened the keeping time of fillets. Taking the proper precautions, it was possible to conserve the fillets 20-40 days at 38° F. It is important to reduce the low-temperature fish spoiling bacteria.

251H. Palatability changes in stored cod fillets.

DYER, F. E., AND DYER, W. J. *Fisheries Res. Bd. Canada Atl.,* No. 41, 3-9, Jan. 1948.

Aging of fish does not increase the palatability. The freshest fish has the highest palatability rating. Quality is steadily lowered during storage. Even before spoilage tastes or odors become noticeable, the palatability is reduced to 60% of that of fresh fish. Under the conditions of the experiment it took the fillets approximately 8 days at 32° F. and 3 days at 41° F. to reach the unacceptable stage. Fish that rated "good" or "perfect" had a trimethylamine value of less than 1, that rated "fair" was less than 10, "borderline" varied from 5 to 30 and "spoiling" and "spoiled" 15 to 30 and over. A table showing the quality of fillets assigned to different grades as shown by odor, taste, trimethylamine value and age is given.

252H. Fresh and frozen shrimp in refrigerated storage.

FIEGER, E. A. *Refrig. Res. Found., Bull.* 48-2, 1-2, Feb. 20, 1948.

The low bacterial count (7,400 per gram) of freshly caught shrimp shows that the fisherman starts with a very clean product, and for the industry to supply the consumer with a quality product it is necessary only to maintain this condition. During iced storage in bins of the trawler for periods of seven to ten days the bacterial count of the shrimp in the bottom layer increased to a million or more per gram. Shrimp which were placed in upper layers had much lower bacterial counts than those of similar age in the bottom layer.

MILK AND DAIRY PRODUCTS

253H. Permanency of synthetic ascorbic acid added to milk.

HOLMES, A. D., AND JONES, C. P. *J. Dairy Sci., 31,* 99-102, Feb. 1948.

Two series of 20 samples each were prepared by adding 75 mg. or 150 mg. of ascorbic acid to a liter of raw cow's milk. The samples were stored in 500-cc. flasks in the dark at 10° C. As aliquots were removed day by day for analysis, the volume of milk decreased and the volume of air in the flasks increased correspondingly. For the series of samples of milk to which 75 mg. of ascorbic acid per l. was added, the loss was 11% per day for the first 3 days and 5% per day for the remaining 7 days, or 7% per day for the entire period. For the series of samples of milk to which 150 mg. of ascorbic acid per l. was added, the loss was 6% per day for the first 4 days and 1% per day for the remaining 6 days, or an average of 3% per day for the 10 days of storage.

254H. The time factor in high-temperature short-time pasteurizing.

ROBINSON, H. B., AND MOSS, C. M. *J. Milk Food Tech., 11,* 44-51, Jan.-Feb. 1948.

Various methods and techniques for timing high temperature short-time pasteurization are described and analyzed. Timing runs using water instead of milk introduces serious errors and milk run tests are recommended, although empirical corrections can be made using volume-delivered and temperature-fluctuation techniques with water.

255H. Phosphatase test for various dairy products.

SANDERS, G. P., AND SAGER, O. S. *J. Dairy Sci., 30,* 909-20, Dec. 1947.

Various techniques for carrying out the phosphatase test for determining adequacy of pasteurization of various dairy products are described and evaluated.

256H. Flavors in milk from the farm.

DOAN, F. J. *Milk Dealer, 36,* 72-76, Aug. 1947; *J. Dairy Sci., 30,* A 190, No. 467, Dec. 1947.

Undesirable flavors found in milk coming from the farm, listed in the order of their frequency, are: (a) feed and weed, (b) cowy or barny, (c) salty, (d) rancid, (e) bacterial, (f) flat, (g) bitter, and (h) foreign. The cause and prevention of these undesirable flavors are discussed.

257H. DDT in human food.

FITZHUGH, O. G. *Food Ind., 20,* 136, Jan. 1948.

Butter made from milk of cows which have eaten forage treated with DDT may be a menace to human health. The cows transmit the insecticides to their milk where it is concentrated in the butterfat portion, so that a relatively small amount in the whole milk could possibly result in an injurious amount in butter.

PECTIN—JAMS AND JELLIES

258H. Preservation of vitamin C in jams, marmalades and jellies.

CHEFTEL, H. et al. *Bull. Soc. Sci. Hyg. Aliment, 34,* 10-23 (1947); *Nutr. Abst. Revs., 17,* 44, No. 519, July 1947.

The preparation of rosehip jam and blackcurrant jam and jelly was studied on the laboratory and factory scale. Ascorbic acid was estimated by indophenol titration before and after treatment with H_2S. With fresh fruits the losses of vitamin C in the process varied from 10 to 27% for rosehips and from 5.3 to 19.4 for blackcurrants. In some cases blackcurrants were frozen to —15° C. and stored for some months, then defrosted and stewed or made into preserves. Losses of ascorbic acid tended to be somewhat higher with frozen fruit, as much as 34.5% being calculated as lost in defrosting on a commercial scale.

The ascorbic content was examined in marmalade made from orange peel, in rosehip jam and in blackcurrant jelly during storage for several months. Satisfactory retention was found in all samples, provided the containers were well filled and sealed. Some reversible oxidation occurred in the surface layers, and variable results were obtained on samples taken from different parts of a jar or tin. A simple experiment with a pectin jelly indicated that ascorbic acid could diffuse through such a medium and it was thought probable that diffusion might account for irregular results unless samples were taken from homogeneous mixtures of the entire contents of a jar.

259H. Contribution to the study of the rheological properties of pectin jellies.

CHEFTEL, H., AND MOCQUARD, J. *J. Soc. Chem. Ind., 66,* 297-98, Sept. 1947.

An apparatus is described which is designed to allow the continuous recording of the rheological properties of gels. Results obtained are discussed.

260H. The control of the pH of jams.

HINTON, C. L. *J. Soc. Chem. Ind., 66,* 381-6, Nov. 1947.

Neutralization curves of fruit acids and other jam constituents are used to compute curves for commercial jams. From these curves, formulas are derived for calculating the quantities of citric acid, sodium bicarbonate or sodium citrate to be added to change the pH of jams by required amounts.

261H. Pectic acid compositions.

BAIER, W. E. Assignor to California Fruit Growers Exchange. 2,436,086, Feb. 17, 1948.

As a new composition of matter, a substantially dry and chemically stable mixture comprising pectic acid and sodium bicarbonate in which the ratio of pectic acid to sodium bicarbonate is within the range of about 2.6 to 3.1 parts of pectic acid to one part of sodium bicarbonate, the mixture being capable of liberating carbon dioxide upon addition of cold water.

262H. Hemostatic effect of pectins.

ROEMER, H. *Klin. Wochenschr., 20,* 686-90 (1941); *Biol. Abst., 21,* No. 19205, Oct. 1947.

The hemostatic properties of pectin were investigated according to the method (bleeding-time in rabbits) (Z. Gynäk. 115, H. 2) in comparison with Sangostop. The following results were found: the shortening of the bleeding time does not depend on the pectin solution pH. High-molecular solutions (Araban, Dextrin) have no specific hemostyptic effect, although the size of various pectin molecules (lemon, apple, carrot) is important. The experiments are not conclusive.

263H. Process of modifying starch.

KERR, R. W., AND SCHINK, N. F. Assignors to Corn Products Refining Co. 2,438,855, Mar. 30, 1948.

Process of modifying sweet potato starch for use as a gelling agent which comprises: introducing into a water suspension of the starch 0.077%-0.155% of dry substance formaldehyde based on the dry substance starch and enough acid to give the suspension a pH of 1.6-2.0; heating the suspension for 3-6 hours at a temperature of 100°-105° F.; neutralizing the suspension to a pH of 6.2-6.8; filtering the suspension; re-suspending the filter cake in water; adding enough sodium bisulfite to react with the free formaldehyde; filtering the suspension and washing and drying the resultant modified starch.

VEGETABLES

264H. Process for treating tomatoes.

CHILDS, D., BRAUN, A. E., AND HANSON, J. Assignors to Libby, McNeill & Libby. 2,437,937, Mar. 16, 1948.

The process of treating tomatoes, which comprises immersing them in approximately a 60% solution of calcium chloride maintained at a temperature of approximately 280° F., and continuing the immersion treatment for a period of approximately fifteen seconds to sixty seconds depending on the maturity and variety of the tomatoes, and finally removing the exocarp freed by such immersion treatment.

265H. Notes on maize.

HERZKA, A. *J. Soc. Chem. Ind., 66,* 396-7, Nov. 1947.

A discussion with experimental detail is given of the popping of corn and of the varieties to which this operation is limited.

266H. Process for the treatment of green peas.

DUNKLEY, M. E. 2,437,155, Mar. 2, 1948.

A process for the treatment of green peas, the steps of momentarily subjecting the unshelled pea pods to a relatively high temperature of the order of 2000° F., for a relatively short period of time such as a period of the order of from two to four seconds, thereafter chilling the pods by contact with water, gently agitating the pods while immersed in the water to remove the peas from the pods, and then removing peas from the pods by screening.

267H. Make the most of your tenderometer.

KRAMER, A. *Canning Tr., 70,* 7-8, March 1, 1948.

A method is presented for standardizing tenderometers by reference to the alcohol insoluble solids of the canned or raw peas. Tables are presented showing the relation of tenderometer values to percent of maximum yield and to the amount of swelling that would be expected during processing.

268H. Ascorbic acid retention in cooked vegetables.

NOBLE, I., AND WORTHINGTON, J. *J. Home Ec., 40,* 129-30, Mar. 1948.

Cabbage, rutabagas, and green beans were tested, it was found that large and moderate-sized pieces of vegetable retain equal quantities of soluble nutrients when cooked in boiling water but that very small pieces retain a smaller amount.

269H. Browning of dehydrated vegetables during storage.

LEGAULT, R. R. et al. *Ind. Eng. Chem., 39,* 1294-99, Oct. 1947.

The rate of nonenzymatic browning of dehydrated vegetables has been studied as a function of temperature, moisture content, and confining atmosphere. The browning proceeds in linear fashion up to, and for a reasonable distance beyond, the limit of palatability for dehydrated nonsulfited carrot, white potato, onion, and sweet potato. The effect of oxygen on the browning rates of these four dehydrated vegetables is relatively small. The browning rates vary exponentially with the reciprocal of the absolute temperature. The temperature coefficients are high the Q_{10} values varying from 5.0 to 8.4 among these four vegetables. The browning rates vary exponentially with the moisture content over the range studied.

270H. Persistence of DDT and benzene hexachloride in soil.

SMITH, M. S. *Nature, 161,* 246, Feb. 14, 1948.

After 18 months more than 95% of DDT and 80-94% benzene hexachloride remains in soil. DDT treated soil permitted normal germination and early growth of cress, oats, and wheat, whereas those treated with benzene hexachloride inhibited root growth.

PHYSICAL CHEMISTRY

271H. Definitions of pH scales.

BATES, R. G. *Chem. Revs., 42,* 1-61, Feb. 1948.

A review of the various means of defining and measuring pH is given. The pH, according to Sorensen, designated as psH in this review should be increased by 0.04 to convert to pH based on the hydrogen ion activity designated by paH. In view of the multitude of pH scales used, all published values should be accompanied by a statement of the type of cell measured, of the standard potential used in computing the results. When the pH meter is used, the pH values of the standard reference solutions with which the instrument was calibrated should be specified.

272H. Moisture measurement with an electronic dew point indicator.

SUOMI, V. E. *Instruments, 21,* 178-82, Feb. 1948.

An instrument that can "accurately and rapidly" measure the moisture content of air samples over a wide range of temperatures is described. Although it was developed primarily for meteorological use, it has many interesting applications in industry and agriculture.

273H. Dewpoint temperature device.

Pittsburg Lectro Dryer Corp. *Refrig. Res. Found., Bull.* 48-3, 5-6, Mar. 17, 1948.

Dewpoint temperature device is essentially a small inner and outer compartment. The operator looks through a window in the outer compartment and watches the polished outer surface of the inner compartment, as air passes over it. At the same time the acetone and crushed dry ice in the inner compartment is stirred with a thermometer, through the open top. Thus, temperature is read when dew forms.

274H. Thin glass window to withstand high pressures.

SEREN, L. *Rev. Sci. Instr., 19,* 123, Feb. 1948.

A simple glass window is described which has been found to withstand 10,000$_{p.s.i.}$. It is made from pyrex pressure tubing of ⅛" wall and ½" i. d. Window thicknesses of ⅛" to 1/32" were tried and were successful.

News of the Institute

REPORT OF COMMITTEE ON EDUCATION AND CURRICULUM

The Committee has continued its effort to maintain contact with developments pertaining to education and curriculum in the colleges and universities of this country and Canada. Specifically, it has attempted to keep an up-to-date list of colleges and universities offering curricula in Food Technology. In addition, it has been studying the problems involved in course content and certification of curricula. In this latter connection, a survey of members of I. F. T. having staff status in the colleges and universities with reference to their opinions on the minimum requirements for a desirable curriculum in Food Technology has just been completed. Pertinent information on these activities is given below:

1. *Institutions offering curriculum in Food Technology.*

Bucknell University	Pennsylvania State College
College of the Pacific	Rutgers University
Cornell University	Syracuse University
Illinois Institute of Technology	Texas A & M College
Iowa State College	University of California
Massachusetts Institute of Technology	University of Illinois
Michigan State College	University of Maryland
New York University	University of Massachusettes
Ohio State University	University of Minnesota
Oklahoma A & M College	University of Washington
Oregon State College	University of Wisconsin

2. *Poll on minimum requirements for a Food Technology curriculum.*

As indicated in the last Committee report, discussions have been had concerning the desirability of polling the I. F. T. membership with reference to the minimum requirements for a Food Technology curriculum. Both because the total membership is so large and also because most members are relatively unfamiliar with the technicalities of curriculum building, course titles, credit hours, etc., it was decided to poll first only members with staff positions in colleges and universities. It was felt desirable to elicit such information from this group since, largely through its efforts, Food Technology curricula are evolved or modified. Therefore, a questionnaire was prepared and distributed. The data collected should provide excellent background material for future discussion and action on curricula and other aspects of educating Food Technologists. In fact, the Committee suggests that a forum on this subject be planned for the 1949 I. F. T. meeting in San Francisco.

The data collected are summarized as follows:

A. General Information

1. To whom was the questionnaire sent?
   a. To members of the Institute of Food Technologists having status (rank of instructor or higher) in colleges or universities
   b. 166 questionnaires were mailed; 78 were returned
2. Institutional Affiliations
   a. Of respondent group
      76% are in land-grant colleges

19% are in arts and science colleges and universities
5% are in technological institutes

b. Of total I. F. T. membership with staff status in colleges and universities
69% are in land-grant colleges
22% are in arts and science colleges and universities
9% are in technological institutes

3. Departmental affiliations

a. Of respondent group
21% are members of Food Technology Departments
17% are members of Chemistry Departments
16% are members of Bacteriology Departments
16% are members of Home Economics Departments
12% are members of Dairy Departments
10% are members of Horticulture Departments
8% are in miscellaneous departments

b. Of total I. F. T. membership with staff status in colleges and universities
25% are members of Chemistry Departments
18% are members of Bacteriology Departments
15% are members of Food Technology Departments
14% are members of Home Economics Departments
10% are members of Dairy Departments
9% are members of Horticulture Departments
9% are in miscellaneous departments

B. Summary of Specific Course Data

Course	Voting Yes	Probable Duration
Chemistry	%	*Semesters*
General and Inorganic	100	2
Organic	92	2
Qual. Inorganic	89	1
Quant. Inorganic	88	1
General Biochemistry	69	1
Physical	64	2
Food	64	1
Colloid	44	1
Agr. Biochemistry	39	..
Physiological	29	..
Chemical Engineering		
General Chemical Engineering	64	1
Unit Operations	41	1
Equipment Design	23	..
Chem. Engineering Problems	11	..
Other Engineering		
Engineering Drawing	52	1
Refrig. and Air Conditioning	43	1
Plant and Equipment Design	24	..
Materials Handling	12	..
Time and Motion	7	..

Course	Voting Yes	Probable Duration
Physics	%	*Semesters*
Mechanics and Heat	89	1
Electricity and Magnetism	84	1
Light and Sound	68	1
Biophysics	12	..
General Biological Sciences		
Human Nutrition	64	1
Botany	59	1
Zoology	49	1
General Physiology	46	1
Entomology	36	..
Biology	33	..
Plant Physiology	21	..
Hygiene	17	..
Plant Pathology	16	..
Animal Physiology	13	..
Microbiology		
General	96	1
Food	80	1
Sanitary	56	1
Mycology	32	..
Physiology of Bacteria	23	..
Pathogenic	22	..

Course	Voting Yes	Probable Duration
Languages	%	*Semesters*
English:		
General Composition	91	2
Speech	80	1
Report Writing	69	2
Literature	52	1
French or German (Reading knowledge)	56	4
Miscellaneous		
General Economics	80	1
Mathematics (a)	56	4
Marketing Food Products	35	..
General Accounting	33	..
Agricultural Economics	31	..
General Psychology	28	..
Labor Relations	25	..
Business Law	25	..
General Marketing	23	..
General Sociology	22	..
Cost Accounting	10	..
Human Engineering	8	..
Patent Law	7	..
Food Technology and Agriculture		
Animal Husbandry and Crop Production:		
Horticulture	28	..
Agronomy	23	..
Animal Husbandry	21	..
Dairy Husbandry	15	..
Crops	14	..
Poultry Husbandry	7	..
Food Technology:		
General Food Technology	76	2
Canning Technology	48	1
Freezing Technology	43	1
Dairy Industry (b)	27	..
Fruits and Vegetables (b)	25	..
Fats and Oils (b)	25	..
Meat Packing (b)	24	..
Fermented Foods (b)	24	..
Milling and Baking Tech. (b)	19	..
Sugar and Candy Tech. (b)	19	..
Poultry Products (b)	13	..

(a) Mathematics was unintentionally omitted from the questionnaire. Fifty-six percent of the responderts inserted it as a requirement; 48% indicated requirement should involve a sequence through two courses in calculus.

(b) A general course embracing all commodities was suggested by 12% of the respondents.

C. Summary of "General Consideration" Questions

1. Are you in favor of a special curriculum in Food Technology?
   90% answered yes
   10% answered no

2. If so, should it be four or five years in length?
   39% favored a 4-year curriculum
   58% favored a 5-year curriculum
   3% favored a 6-year curriculum

3. Should practical experience be required?
   90% answered yes
   10% answered no

4. If answer to "3" is yes, how much should be required?
   42% favored 2-3 months
   48% favored 4-6 months
   10% favored 7-12 months

5. Are you in favor of graduate work in Food Technology?
   94% answered yes
   6% answered no

6. If answer to "5" is yes, do you favor limiting it to a M.S. degree or extending it also to Ph.D.?
   80% favored a full graduate program (i.e., M.S. and Ph.D.)
   20% favored limiting graduate work to a M.S. degree

D. General Comments

Not all the returned questionnaires were satisfactorily filled out. The course content data of three had to be discarded. In the interests of making a satisfactory report of the survey, certain liberties were taken in interpreting the data. For example, it was hoped that some reliable recommendation relative to credits per course would be secured from the data. Unfortunately, many of the respondents did not provide realistic answers. Consequently, the best we are able to glean from these data is an estimate of the recommended duration of the more important courses.

It was hoped that it would be possible to find out just what is the character of the courses thought to be essential. This analysis was to be based on the prerequisite(s) shown for each course. For example, Physical Chemistry with a calculus prerequisite is obviously a much more basic course than that offered without such a prerequisite. Here again many respondents did not generally provide complete or realistic information. This is unfortunate. No pertinent information was obtained with respect to this problem.

In general, the results speak for themselves and indicate that many courses are considered to be of sufficient importance to be included on the list of minimum requirements. These include several basic chemistry courses, including physical chemistry, two applied chemistry courses (biochemistry and food chemistry), general chemical engineering, engineering drawing, three courses in basic physics, human nutrition, botany, zoology, and possibly physiology, courses in general, food, and sanitary microbiology, two terms of general composition and report writing, and one each of speech and literature. A majority of the respondents voted for the inclusion of sufficient French or German to provide reading knowledge of one or the other. Other courses receiving substantial majorities include general economics, mathematics, and general food technology.

There is a considerable lack of agreement concerning the need for applied course work. The results show that most of these received less than a 40% vote. Also, there were a considerable number of written-in courses, especially under the Food Technology category. These included: technical food literature, research, food preparation, and evaluation, etc.

The answers to the "General Consideration" questions are interesting. It is obvious that a great majority of the respondents favor a special curriculum and practical experience and feel that graduate work should be available for those interested and qualified. There was some difference of opinion concerning the length of the curriculum, the 5-year program being the most favored period. A large majority of the respondents favored a 2-6 month period in which to secure practical experience. A large majority also favored making a full graduate program available.

The distribution of respondents from among the three types of institutions and the seven types of departments is interesting when compared with the distribution among all I. F. T. members holding staff positions in colleges and universities. The results indicated that relatively fewer members in Chemistry departments and larger numbers of members in Food Technology departments answered the questionnaire than exist in the I. F. T. membership as a whole. This seems natural, since members of the Food Technology departments obviously are much interested in the training

of food technologists. Members of departments other than Chemistry and Food Technology answered the questionnaires in about the same proportion as they are represented in the total I. F. T. membership.

This report is respectfully submitted on this 6th day of June, 1948.

VICTOR CONQUEST
R. A. DUTCHER
WILLIAM F. GEDDES
WALTER A. MACLINN
EMIL M. MRAK
BERNARD E. PROCTOR
GEORGE F. STEWART, *Chairman*

REPORT OF EDITORIAL BOARD ON PROJECTED CHANGES IN "FOOD TECHNOLOGY"

At a meeting of the Editorial Board of FOOD TECHNOLOGY held in Philadelphia on June 8, 1948, some changes in FOOD TECHNOLOGY were recommended that will be of interest to I. F. T. members in general.

A change in format and frequency of issue of the journal is planned, to meet satisfactorily the existing budget situation. Effective January 1, 1949, the size of the journal will be increased to 8⅝ by 11¼ inches. The cover will be "dressed up," preferably with color, and the journal will appear monthly instead of quarterly as in the past. All departments now carried in the journal will not necessarily be included as monthly features, but the two sections "News" and "Abstracts" will appear monthly on a scale such as to make the total volume of material printed in each section during a year equal approximately to the total volume of material printed quarterly in the past. The total number of pages per volume will be about 600.

Beginning with the first issue of Volume 3, January 1949, advertising matter will be included in FOOD TECHNOLOGY. Institute members are asked to cooperate in influencing those having charge of advertising in their organizations to make advertising contracts.

It is planned to publish the proposed agenda of Council Meetings in advance of the actual meetings and to publish briefs of such meetings after they have been held. This information will appear in the section on "News of the Institute."

A section on book reviews is planned. This section will include a list of new books with their prices, authors, and publishers.

Thus far the section on "Industry and Legal Viewpoints" has been composed almost entirely of papers presented before the general session of the Seventh Annual Convention of I. F. T. The Editorial Board regards this section as worthy of continuance, and in future issues of the journal it is planned to publish abridged or complete papers concerning industrial and economic matters. Special papers on industrial and legal viewpoints will be solicited.

It is proposed to have a section headed "Notes and Letters." This idea was endorsed at the 1947 meeting, but the section has not yet materialized because of lack of appropriate letters or notes. To save space and utilize otherwise unused portions of printed pages, the letters and notes may be scattered through the journal instead of being concentrated in one section.

A plan of rotation of membership on the Editorial Board, which has been under discussion for the past year, will be put into effect as of January 1, 1949. Beginning

on that date, the term of office of Associate Editors will be four years and immediate reappointment will be impossible. On that date, four new members will take up their duties on the Board, succeeding four present members whose tenure of office will be terminated then. Except in special cases, terminations will occur by lot. The Editor will reserve the right, for the initial shift in the plan of rotation, to withhold the names of any Associate Editors who have been recently given special assignments. This will enable the various departments to become well established before changes in their supervision are made.

The monthly publication of FOOD TECHNOLOGY *in 1949 will necessitate more prompt sending of news to the Associate Editor responsible for the section on "News of the Institute." The secretaries of the various regional sections and, in fact, all I. F. T. members are urged to cooperate in making the monthly publication of "News of the Institute" a success.*

1949 CONVENTION

Although details for the 1949 convention have not fully crystallized, it is definite that the convention will be held in San Francisco from July 9 to July 14, inclusive, and that the Northern California Section will be the host.

The entire Civic Auditorium in San Francisco has been reserved for this annual meeting of I. F. T. and for the Food Products, Materials, and Equipment Exposition. The exposition will be open to the public. The job of handling the exhibits has been assigned to Kriedt and Meyers, exhibit managers, and several booths for the 1949 meeting have already been sold.

The registered attendance is anticipated to be approximately 2,000, and it is expected that at least 100 delegates from foreign countries will be present. Hotel reservations are already being received. Those thinking of going to San Francisco next July should give consideration to their reservations now. San Francisco will be full of conventions during the 1949 Centennial year, and I. F. T. members do not want to be disappointed in their reservations.

Transportation information will be out soon. Meanwhile any one desiring such information should contact the Secretary of the Northern California Section, Ernest E. Jacobs (Lyons-Magnus, Inc., 2545 Sixteenth St., San Francisco 3, Cal.).

RECOGNITION

Dr. F. C. Blanck, of the Mellon Institute, has been appointed liaison representative for I. F. T. on the Food and Nutrition Board of the National Research Council.

Dr. Barbour Lawson Herrington of Cornell University, a member of the Western New York Section of I. F. T. since its founding and active in its development, is to receive the Borden Award at the American Chemical Society meeting in Portland, Oregon. This Section is greatly pleased that one of its members is to be so recognized and joins with the American Chemical Society in extending its sincerest congratulations.

Dr. Louis B. Howard, Chief of the U.S.D.A. Bureau of Agricultural and Industrial Chemistry, has been appointed the head of the recently formed Department of Food Technology in the College of Agriculture, University of Illinois. Dr. Howard has been associated with the U.S.D.A. since 1930, serving as assistant to the Director of the Northern Regional Research Laboratory from 1939 to 1940, when he became head of the Commodity Byproducts Division of the Western Regional Research Laboratory at Albany, California. In that position he coordinated the research and development programs of the Laboratory, dealing with dehydration of fruits and

vegetables and with other methods of food processing. Appointed Assistant Chief of the Bureau of Agricultural and Industrial Chemistry in November 1945, he was made Chief on April 1, 1946. He assumed his new duties at the University of Illinois on October 1, 1948.

Dr. Emil M. Mrak, Chairman of the 1948-49 Program Committee of I. F. T. and Associate Editor of FOOD TECHNOLOGY, has been appointed head of the Department of Food Technology at the University of California.

Dr. George F. Stewart was recently appointed Associate Director of the Agricultural Experiment Station, Iowa State College, Ames, Iowa. He has been associated with this college for the past ten years, first as Research Associate Professor and since 1942 as Professor of Poultry Research. Since 1945 he has acted as Chairman of the Administrative Sub-Committee, Graduate Committee on Food Technology. From 1942 to 1947 he served as consultant on food research and development for the Army. During the war years he also served as adviser and collaborator with research agencies of the United States Department of Agriculture, particularly with the Western Regional Research Laboratory at San Francisco. In 1946-1947 he was Chairman of the Education Committee of I. F. T.

STEPHEN M. BABCOCK AWARD

(Picture courtesy of *Food Industries*)

Dr. Frederick C. Blanck of the Mellon Institute is presented the Nutrition Foundation's Stephen M. Babcock Award for achievement in food technology, by George J. Hucker, former President of I. F. T., at the national meeting of I. F. T. in Philadelphia June 1948.

Dr. Frederick C. Blanck, Administrative Fellow of the H. J. Heinz Co. Fellowships at the Mellon Institute of Industrial Research, Pittsburgh, was selected by a jury of I. F. T. members to be the first recipient of the Nutrition Foundation's

Stephen M. Babcock Award. The award, made in recognition of his outstanding contributions to the field of food technology, was presented to Dr. Blanck (see photo) by the retiring I. F. T. President, George J. Hucker, at the June 1948 national meeting of I. F. T. in Philadelphia. An honorarium of $1,000 accompanied the award. Dr. Blanck's acceptance speech is published in full elsewhere in this issue of FOOD TECHNOLOGY. (See page 349). We extend to Dr. Blanck our heartfelt congratulations on this well merited honor.

JOINT MEETING IN CALIFORNIA

The editor's office received, almost too late for mention in this issue, a copy of the program which will feature the Third Annual Conference of the Northern and Southern California Sections, which will be held in the Mayfair Hotel, Los Angeles, California, on October 29th and 30th. The outstanding merit of this program is apparent from the following list of speakers: Arthur Prater, George Marsh, A. O. Beckman, W. M. Martin, Carl Fellers, Henry Borsook, William Pentzer, Charles D. Fisher, and Harry J. Deuel.

IN MEMORIAM

Ralph H. Neal, Chief Food Technologist of The Best Foods, Inc., Bayonne, N. J., died July 1 at the age of 41. Mr. Neal graduated (B.S.) from the University of Cincinnati in 1928 and spent nearly twenty years with The Best Foods, Inc., Laboratories. He was widely known in the edible fat industry and was intimately connected with the development of domestic vegetable fat margarin in the United States. He had been a member of I. F. T. for many years and a regular attendant at the meetings of the New York Section.

Regional Section News

CHICAGO SECTION

C. L. Smith, current Vice-Chairman, has been appointed temporary Chairman of the Section's 1950 National Conference Committee and is starting to organize the Section's committee for conduct of this conference.

A. I. Kegan has recently completed 12 weeks at the University of Minnesota as visiting professor, where he gave courses on "Patent Law for Scientists and Engineers." This was the first special course in patent law at the university and included a discussion of patents on food manufacture.

Colonel C. S. Lawrence has recently been appointed President of the Quartermaster Board, Camp Lee, Virginia, and will be replaced in Chicago by Lt. Col. Joseph S. Kujawski as Commanding Officer of the Food and Container Institute. Col. Lawrence has been an active member, and the Section is sorry to lose him from the Chicago area.

H. E. Bernhardt, who served as Treasurer of the Section for a number of years, has been transferred to Camden, N. J., by the Campbell Soup Co.

Captain Velt Stafford, formerly of the Food and Container Institute in Chicago, is now associated with the Chase Candy Company, St. Louis, Mo.

NORTHERN CALIFORNIA SECTION

At the June 24 meeting of the Northern California Section in Berkeley, "Dutch" Diehl, the new national I. F. T. president, was given a hearty ovation. Dr. Diehl

informed the group that he had a three-point program which he hoped, with everyone's cooperation, would be realized during his term of office, namely, consolidation, recognition, and perpetuation.

At this June meeting Emil Mrak spoke on the highlights of the Philadelphia convention, and Ray Junk covered the 1949 convention plans. (See July issue of FOOD TECHNOLOGY for statement regarding main address of the meeting.)

Visitors from Southern California welcomed at this meeting included Gerhard W. Kusserow of the Gerber Products Co. (Oakland), Anthony J. Lorenz of the California Fruit Growers Exchange (Los Angeles), and Louis B. Rockland of the University of California (Los Angeles).

In the door prize drawing at the June meeting, R. R. Legault of the Western Regional Research Laboratory won a case of baby food and John B. Patten of the U.S.D.A. Fruit and Vegetable Bureau, a case of soup.

Meetings of the Executive Committee were held on June 24 and July 29, at which time ten additional members were approved.

At a meeting of the Executive Committee held in April, incorporation of the Northern California Section was discussed. It was felt that this procedure is the only adequate means for protecting individual members of the Section from possible lawsuits. At the June meeting, Gordon MacKinney made a motion "to incorporate the Northern California Section or otherwise protect the Section from claims resulting from the 1949 convention, statements in the *Hornblower*, etc." This motion was seconded and passed, and the Section Chairman and Secretary were authorized to take whatever steps might be necessary to accomplish this.

The first Far Western Packaging Show was held in the Civic Auditorium in San Francisco from August 10 to 13. Several members of I. F. T. were instrumental in making the show an outstanding success.

On August 19 there was a dinner meeting of the Section in San Francisco, following which representatives of the College of Agriculture of the University of California (Davis) discussed the significance of the introductions of new varieties of fruits and vegetables to the food processor. This meeting had an international touch in that among those present were Mrs. Juracy Tejo of the Department of Agriculture at Brazil, and Mr. Georg Borgstrom, head of the Food Institute of Sweden. Following the custom started earlier in the year, four door prizes were distributed. This feature seems to be popular with the members attending.

The program for the evening of August 19 was handled by Professor Russell Perry of the University of California, at Davis. He showed an interesting motion picture of a newly developed machine for the mechanical harvesting of almonds. Based on the principle of the machine developed in Oregon for filberts, this new machine appears to be doing a good job for the California almond growers.

Following the motion picture, Mr. G. C. Hanna, Lecturer in Truck Crops, University of California at Davis, spoke on "Factors Involved in the Development of New Truck Crop Varieties." Confining his remarks to work being done on tomatoes, he covered interestingly the various phases of the breeding and cross breeding of varieties until a new variety with all the desired factors is obtained.

The annual meeting of the Section will be held on December 2. The program will consist of a series of short submitted papers. Any member of the Institute who will be in the vicinity of San Francisco on December 2 and who would like to contribute a paper to the program should get in touch with Ray Junk, Program Committee Chairman.

Among those present at the Philadelphia convention were Irene McCarthy, Ray Junk, Hugh Griswold, Alan Richardson, Emil Mrak, John R. Matchett,

Helen L. Hanson, A. N. Prater, Charles T. Townsend, C. (Charlie) Stumbo, Lee Nutting, Dr. and Mrs. George L. Marsh, Robert M. Stephenson, and R. N. Berry.

During 1947 and 1948 the *Hornblower* was published every other month, three weeks in advance of the regular meetings of the Northern California Section. During 1949 it is planned to publish regular issues monthly and special issues for the months of March, June, and August. A special issue with information about the San Francisco convention has already been published (June 1948), and another is planned for December 1948. In addition, special convention issues will be published daily from July 9 to July 14, 1949, during the annual meeting of I. F. T. in San Francisco. The regular issues of the *Hornblower* are mailed to all members of the Northern California Section, to national officers of I. F. T., and to each other regional section of I. F. T. The special issues will be mailed to the entire national membership, as a means of promoting the 1949 convention. The daily convention issues will deal exclusively with the annual meeting, will report the registration of members, the daily program for the meeting, other activities, and other matters of special interest. These daily issues will be delivered to all registered members before 9 a. m. by special messenger. Additional copies will be distributed at the meetings and at the exposition. It is planned to have the August 1949 issue serve as a special convention review.

The August 1948 issue of the *Hornblower* contains a directory of the members of the Northern California Section, corrected to July 1948. It is hoped that this feature will continue annually. According to this directory, this Section now has 362 members, of which 296 are members both of the regional section and of the national organization, 63 are regional associates, and 3 are honorary members.

Another publication bearing the name of *Hornblower*, and published by the California Fertilizer Association, has had its name changed to *Plant Food Facts*.

William V. Cruess (past President of I. F. T. and the first recipient of the Nicholas Appert Award) continues on full-time active duty as Professor of Food Technology and Chemist in the Agricultural Experiment Station, University of California. At his own request to the University, his former administrative duties as Chief of the division have been transferred to his colleague, Dr. Emil M. Mrak. It is gratifying news to the members of I. F. T. that Dr. Cruess is still in harness in teaching, research, and public service, and is as anxious as ever to give help and counsel to members of I. F. T.

Paul E. Hile has been transferred to the New York office of Continental Can and has been succeeded as Chairman of the Reception Committee of the Northern California Section by Robert A. Stewart of the Gerber Products Co.

James R. Morgan of the Table Products Co., San Francisco, has left for Seattle. His post of Business Manager for the *Hornblower* has been accepted by Willis J. Parks of the Owens-Illinois Glass Co.

William V. Cruess (University of California, Berkeley), and Hugh T. Griswold (Owens-Illinois Glass Co.) have been elected National Councilors-at-Large. The latter therefore resigned as Section Councilor, and Mr. Tom Mansfield of the Food Machinery Corporation was appointed to complete his unexpired term.

Professor Cruess is Program Chairman for the April 1949 meeting of the Fermentation Section of the American Chemical Society.

Emil Mrak of the University of California (Berkeley) has been appointed National Program Chairman. Emil and Vera Mrak flew to Mexico City for a vacation early in July, then to Salt Lake City, then to Des Moines on business for Emil, and in August back to Berkeley.

NORTHEAST SECTION

At the final meeting of the year, held in May at Amherst, Massachusetts, the announcement was made that a total sum of $2,200 was netted at the national I. F. T. meeting held in Boston in June 1947. Of this amount, $1,500 has been turned over to the national Secretary-Treasurer as a New England contribution to the national I. F. T.

Professor B. E. Proctor, Director of the Food Technology Laboratories at Massachusetts Institute of Technology, has been elected Vice-President of the national I. F. T., and Professor Carl R. Fellers, Head of the Department of Food Technology at the University of Massachusetts, Amherst, Mass., has been re-elected national Secretary-Treasurer.

Dr. S. C. Prescott, Dean Emeritus of Science at M. I. T., has been awarded a certificate by the American Chemical Society commemorating his half century of continuous membership in the society.

Professor W. L. Campbell, Head of the Department of Food Technology at M. I. T., spent approximately six weeks this summer on a trip to Hawaii and way stations, to study new food product developments. In Hawaii, he spent the major part of his time at the Hawaiian Pineapple Company in Honolulu. On the way there he stopped off in Houston, Texas, in Tucson, Arizona, and in Los Angeles and San Francisco, California.

Dr. J. T. R. Nickerson, formerly connected with the National Association of Frozen Food Packers in Washington, D. C., has been appointed Research Associate in the Department of Food Technology at M. I. T., as of July 1, 1948.

Mr. Robert Swain has recently joined the staff of A. D. Little, Inc., Cambridge, Mass., in the Food Section.

SOUTHERN CALIFORNIA SECTION

E. Arthur Beavens, of the U. S. D. A. Bureau of Agricultural and Industrial Chemistry at Los Angeles, has been elected a National Councilor.

NEW YORK SECTION

On June 22, at a meeting of the Executive Committee of the New York Section, plans were discussed for the national meeting of I. F. T. to be held in New York in 1951. The New York Section is getting off to an early start on this meeting and has been fortunate in securing the help of Larry Burton, Ira Garard, and Clifford Shillinglaw to serve as a pre-arrangements committee. Larry Burton is the chairman of this group.

Mr. Jesse L. Weinberg, formerly connected with Polak's Frutal Works, Inc., Long Island City, N. Y., has been named Secretary of Food Research Laboratories, Inc., in the same city. He will function as comptroller and general manager of the business affairs of the Laboratories and will have charge of personnel and public relations.

WESTERN NEW YORK SECTION

The Western New York Section will hold its fall meeting at Syracuse University on October 30. The Program Chairman is Professor Richard Henderson and the Associate Chairman is Dr. Edith Nason, who will be assisted by Dr. Betty Watts. Election of officers will take place at this meeting.

MARYLAND SECTION

On August 21, the Maryland Section held a social gathering at the Cottage Grove Beach on Chesapeake Bay, where there was opportunity to meet with the members' families.

On September 10, the Maryland Section convened again for its regular session at the Stafford Hotel in Baltimore. Following the dinner, Mr. J. A. Moore of the American Sugar Refining Company of Baltimore spoke on "The Processing and Refining of Cane Sugar."

PUGET SOUND SECTION

William L. Haley, of the Fisher Flouring Mills Co., took office in Cincinnati in May as National President of the American Association of Cereal Chemists.

Lewis P. Callahan, of Libby, McNeill and Libby, and last year's Chairman of the Puget Sound Section, is in Alaska making his annual study of experimental packs put up by his company.

Norman J. Willett, of the American Can Company and last year's Secretary of the Puget Sound Section, presented a paper on "A Review of the Fish Canning Industry on the Pacific Coast" at the September meeting of the American Chemical Society in Portland, Oregon.

Ray W. Clough, of the National Canner's Association, presented a paper on "The Canning of Crabmeat, with Special Reference to Dungeness Crab" at the Portland meeting of the American Chemical Society.

MOHAWK VALLEY SECTION

A new regional section of I. F. T. has been organized in Canajoharie, New York, under the name of the Mohawk Valley Section. A. S. Burhans of the Beech-Nut Company is Chairman and Lawson L. Bowers of the same company is Secretary of this Section.

The speaker at the first fall meeting, to be held in the Canajoharie Hotel on October 28, will be Dr. Bernard E. Proctor, National Vice-President of I. F. T. It is expected that the Mohawk Valley Section will receive its charter as a part of the events of the evening.

Book Review

THEORY AND APPLICATION OF RADIO-FREQUENCY HEATING, by George H. Brown and Cyril N. Hoyler, research engineers, RCA Laboratories, Princeton, N. J., and Rudolph A. Bierwirth, chief engineer, Sound Incorporated, Chicago, Ill. D. Van Nostrand Company, 1947, 370 pages. Price $6.50.

This new volume on radio-frequency heating should prove valuable to both industrial and development engineers. There is a nice balance between theoretical and experimental approach and between mathematical analysis and technical description. The theory of heat flow in various materials is developed and an appendix is devoted to a method of finding the complete solution for the differential equation of current at a point.

Because of the present importance of induction heating in many manufacturing plants, the major portion of the book deals with good electrical conductors, principally metals. Current relations are analyzed for large and small cylindrical conductors, for penetration and surface effects, for strip heating, and for laminar sheets, such as copper-clad steel. One chapter describes typical experimentation such as paint baking, set-screw hardening, soldering, brazing and welding. Another chapter is given over to the experimental techniques involving the heat flow equations developed by the authors.

The last third of the book covers the heating of poor or relatively poor conductors, largely in specialized fields. Chapter 17, which introduces this subject, is an excellent summary of the fundamentals of heating poor conductors; it should serve the design engineer well. Specific problems are presented, as press problems in the radio-frequency gluing of plywood, the design of a radio-frequency sewing machine, the use of shaped electrodes, the dehydration of rayon and penicillin, the pasteurization of milk and beer, and the sterilization of liquids in high-intensity radio fields.

The last chapter considers the treatment of food products, with the greater part of the discussion devoted to frozen foods. Of special interest to the food technologist are the discussions on frequency and the comparison of induction and capacity heating when applied to a given product. Although the authors summarize briefly, they suggest rather than describe desired experimentation in the field.

Useful graphs, charts and tables are sprinkled liberally throughout this work and a sufficient number of photographs have been included to prevent ambiguity.

O. E. DOTSON.

Selected Abstracts

ANALYTICAL METHODS

275H. Food analysis.

GROVER, D. W. *Food Manuf., 23,* 153, April, 1948.

A comprehensive and critical review of progress made in 1947 in food analysis. Comparison of standard methods is reviewed for such products as dairy, citrus, oil and fats, sugar and starches, fruits and vegetables. An excellent bibliography is also presented.

276H. Inorganic spot test for copper.

GOLDSCHMIDT, F., AND DISHON, B. R. *Anal. Chem., 20,* 373-4 (1948).

The appearance of a violet color when concentrated hydrobromic acid reacts with salts of divalent copper is used as the basis of a spot test for copper. It requires only common inorganic reagents and has a sensitivity comparable to that of copper tests with organic reagents.

277H. Determination of amino nitrogen in corn syrup.

SCALLET, B. L. *Anal. Chem., 20,* 353-4 (1948).

In the manufacture of corn syrup very small amounts of amino nitrogen contribute considerably to formation of undesirable yellow color. The present method shows that a modified Van Slyke method for amino nitrogen can be applied to corn syrup with good results. A 100-cc. reaction vessel is combined with a 3-cc. measuring buret, permitting the use of 25 ml. samples. Determination of amino nitrogen with satisfactory precision is possible in the range from 10 to 40 p.p.m.

278H. Anthocyanin pigments.

SONDHEIMER, E., AND KERTESZ, Z. I. *Anal. Chem., 20,* 145-8 (1948).

The amount of red anthocyanin pigment in strawberry products can be quantitatively determined by measuring the light absorption in extracts made therefrom at 500 mμ and at pH 3.40 and 2.00. The measurement consists of subtracting the optical density at 500 mμ of an anthocyanin solution at pH 3.4 from its optical density at pH 2.0, at known concentration. The increase in color intensity under such conditions is proportional to the concentration of anthocyanin in the solution. A solution of Congo red is suggested as a standard of color intensity. Examples illustrate applicability of the method, which may be used for objective comparison of the red color in different samples of strawberries and in strawberry products of different origin, and to follow color deterioration in the product after manufacture.

279H. Colorimetric lactic acid determination.

MARKUS, R. *Helv. Chim. Acta, 31,* 831-49 (1948). (In German).

The method reported depends upon conversion of the lactic acid to acetaldehyde in sulfuric acid solution and colorimetric estimations of the latter with guiacol. In general, sugars, keto acids, hydroxy acids and other aldehydes interfere.

280H. Constant-level siphoning device.

MAGUIRE, R. D. *Anal. Chem., 20,* 394 (1948).

A floating siphon which cuts off at the desired level by immersion of the intake end of the tube in mercury.

BIOLOGICAL SCIENCES

BIOCHEMISTRY

281H. Oxidizing enzymes in brewing materials. I. An acid active oxidase in malt and barley.

WALLERSTEIN, J. S., HALE, M. G., AND ALBA, R. T. *Wallerstein Lab. Commun., 10,* 209-15 (1947).

Barley and malt contain an acid active oxidase showing a maximum activity on o-phenylenediamine at pH 3.3. The enzyme shows no activity above pH 6.3. The o-phenylenediamine reaction results in the formation of an orange flourescent compound extractable at alkaline pH's in ethyl acetate. The extent of color or flourescence formed by the reaction may be dtermined in ethyl acetate solution and constitutes a measure of enzyme activity. The o-phenylenediamine oxidase shows maximum activity under the conditions of the test at 65° C. It increases during malting and is not greatly affected by the heat of kilning. The enzyme is active throughout the mashing process even after a full hour at 70° C.

282H. The action of β-amylase on corn amylose.

CLEVELAND, F. C., AND KERR, R. W. *Cer. Chem., 25,* 133-9, Mar., 1948.

Corn amylase having a degree of polymerization of 455 when dissolved in alkali and the pH adjusted, was subjected to β-amylase digestion. During the first part of the digestion

substantially only amylose and sugars such as maltose were present. These results may be interpreted by assuming that when the enzyme makes contact with an amylose molecule, this chain is hydrolyzed to maltose before the enzyme atacks another chain.

283H. The amylase inhibitor of Leoti sorghum.

MILLER, B. S., AND KNEEN, E. *Arch. Biochem., 15,* 245-63 (1947).

Discussion of the properties and mode of action of the amylase-inhibiting substance obtained from the bran fraction of *Leoti sorghum.* The inhibitor is soluble in acid solution, but may be precipitated from basic solution by acetone, ethanol, isopropanol, and calcium chloride. It was stable in the presence of 1N HCl or NaOH and was not inactivated by long autoclaving within a wide pH range. It was almost completely recovered after passing through the membrane in dialysis against tap and distilled water; inhibition is reversible since it appears to be the result of a physical adsorption rather than a chemical reaction. A variety of biological substances inactivate the inhibitor. It appears to be a relatively high molecular weight organic acid which contains the indole group and no amino nitrogen.

284H. Action of mold enzymes in starch saccharification.

CORMAN, J., AND LANGLYKKE, A. F. *Cer. Chem., 25,* 190-201, May, 1948.

Fungal α-amylase liquefies starch and converts it to dextrins and maltose, while the glucogenic enzyme system hydrolyzes maltose, dextrins, and apparently starch itself to glucose. Starch saccharification efficiency showed a higher correlation with glucogenic activity than with α-amylase. High glucogenic activity was associated with rapid and almost quantitative glucose formation from starch. Potent mold culture filtrates contain little or no β-amylase. Nevertheless, they saccharified starch to produce yields of fermentable sugars that were as high or higher than were obtained by saccharification with distillers' malt.

285H. The thermal decomposition of carbohydrates.

PUDDINGTON, I. E. *Canadian J. Res., 26B,* 415-31, Apr., 1948.

The thermal decompositions of cellobiose, maltose, dextrose, and potato starch have been studied over a temperature range, by following the production of volatile products. Carbon dioxide, carbon monoxide, and water with small quantities of acids, aldehydes, and volatile solids were produced in all cases. With cellobiose, the first step of the reaction, which involved the elimination of two moles of water per mole of sugar, could be separated from the second step, where the oxides of carbon were produced, by controlling the reaction temperature. Dextrose first dimerized by a rapid reaction and then decomposed in much the same manner as cellobiose. The behavior of maltose was anomalous and no dehydration by a separate step could be detected. The decomposition of potato starch was similar to the second step of the cellobiose reaction.

286H. Enzymatic decarboxylation of β-keto acids.

KARRER, P., AND HAAB, F. *Helv. Chim. Acta, 31,* 795-8 (1948). (In German).

It was shown an enzyme occurs in various species of molds which possesses the property of decarboxylating β-keto acids and connecting them to ketones. This enzyme is different from carboxylase or the d-amino acid carboxylase.

287H. Amino acid impairment in casein heated with glucose.

PATTON, A. R., HILL, E. G., AND FOREMAN, E. M. *Science, 107,* 623-4, June 11, 1948.

Using a comparatively mild treatment of refluxing Vitamin Test Casein (G.B.I.) with 5% glucose solution for 24 hours at 96.5° C., the only amino acids inactivated were lysine, arginine and tryptophan. The decrease in these three was about one-third of the original amount.

288H. The use of ion exchange resins for separation of basic amino acids.

HEMS, B. A., PAGE, J. E., AND WALLER, J. G. *J. Soc. Chem. Ind., 67,* 77-80, Feb., 1948.

The hexone bases can be separated from each other by adsorption on a column of Zeo-Karb 215, and elution with bases and acids of suitable strengths. Some of the nonbasic amino acids are also absorbed. Zeo-Karb 216 adsorbs only the hexone bases but is of low capacity.

MICROBIOLOGY

289H. An elliptometer. A simple method of measuring the areas of structures in microscopic sections.

HAMILTON, J. D., AND BARR, M. L. *Stain Tech., 23,* 123-7, July, 1948.

A simple method of measuring the cross sectional areas of objects (such as cells) in microscopic sections is described. A beam of light is passed through an adjustable diaphragm and focused by a lens on a screen of

mm. ruled graph paper. The screen may be rotated about a horizontal axis. Adjustment of the aperture of the diaphragm and the plane of the screen yields illuminated areas of variable size and degree of ellipticity. As close a "fit" as possible is made between the illuminated area and the camera lucida tracing of the object to be measured. The lengths of the major and minor axes of the appropriate ellipse are read from the screen. The application of the formula for the area of an ellipse to mean major and minor axes for a group of cells gives the mean cross sectional area for the cell population under investigation.

290H. The rapid preparation of frozen tissue sections.

ADAMSTONE, F. B., AND TAYLOR, A. B. *Stain Tech., 23,* 109-16, July, 1948.

The essential feature of this procedure involves the rapid freezing of the tissue following excision and keeping it frozen until the desired chemical or fixative has been applied. For freezing, either carbon dioxide or liquid air is used, as desired. The microtome knife is thoroughly cooled by taping blocks of dry ice to its surface. The cut sections, still frozen, are manipulated by a camel's hair brush so that they lie flat upon the knife. They are then transferred to a slide by a special section lifter. This has the form of a double-bottomed scoop packed with dry ice. Thus the section remains frozen while it is transferred to a clean microscope slide held at an angle above a Coplin jar of the desired reagent. The sections must be immersed just prior to melting. They curl and do not adhere to the slide if still rigidly frozen, and are distorted if immersed after melting. With this technique sections showing a minimum of cellular distortion may be obtained. Consequently, it facilitates the use of many cytological techniques, chemical tests, and enzymatic studies, such as the Gomori techniques, on a variety of tissues.

291H. Application of pectic enzymes to maceration of plant tissues for microscopic study.

HOHL, L. A. *Stain Tech., 23,* 129-31, July, 1948.

A new method of maceration of relatively soft plant parts, such as petioles, fruits, and fruit skins, which depends upon the treatment of the material with pectic enzyme solutions is described. The commercial preparation Pectinol W, as well as pectic enzymes secreted by growing *Aspergillus* species upon pectin-containing media were effective in macerating a variety of plant materials.

292H. Biological process for the production of riboflavin.

TANNER, F. W., WICKERHAM, L. J., AND VAN LANEN, J. M. Assignors to the U. S. of America as represented by the Secretary of Agriculture. 2,445,128, July 13, 1948.

The method of producing high yields of riboflavin comprising cultivating *Ashbya gossypii* under aerobic conditions in a growth medium comprising 0.5 to 10.0% fermentable carbohydrate, a proteinaceous material, and a lipid. A process of preparing riboflavin comprising cultivating *Ashbya gossypii* under aerobic conditions in an aqueous growth medium comprising 0.5 to 10% of a fermentable sugar, corn steep liquor, and proteinaceous material.

293H. Use of ethylene oxide in food conservation.

VERHOEVEN, W. *Voeding 8,* 150-6 (1947); *Chem. Absts. 42,* 2361g, Apr. 10, 1948.

Cornmeal soaked with a suspension of *Penicillium glaucum, Mucor* sp., *Gladosporium herbarum,* and *Aspergillus glaucus* was packed in cellophane bags and a series treated for 1 hr. in an atm. of ethylene oxide. Even after 10 weeks storage no growth was observed. All controls were moldy. Spices treated in the same way gave excellent results. The amt. of ethylene glycol formed gave no cause for alarm from health standpoint.

294H. Food poisoning.

DEWBERRY, E. B. *Nature, 161,* 540, Apr. 10, 1948.

The five main types of food poisoning, namely *Salmonella* infections, toxin outbreaks due to special staphylococci, botulism, poisoning from metal and chemical contamination, and poisoning from poisonous plants are treated separately and adequately in the book.

295H. The mechanism of the effect of X-rays on bacterial toxins.

EPHRATI, E. *Biochem. J., 42,* 383-9 (1948).

Tetanus toxin and staphylococcus haemolysin were destroyed by X-rays. Purification of tetanus toxin greatly increased its sensitivity to X-rays. In both cases the antigenicity was destroyed simultaneously with the toxicity. Certain proteins their partial and total hydrolysis products, reducing amino-acids, glutathione, thioglycollic and ascorbic acids were found to be effective as protective agents, whereas oxidizing substances were ineffective. All the experimental observations support the theory that the mechanism of the effect of X-rays on tetanus toxin and staphy-

lococcus haemolysin is an indirect one, the radiation causing the formation of active oxidizing radicals in the water, which in turn destroy the toxin by oxidation.

NUTRITION

296H. Revise Nutrition yardstick.

Sci. N. L., 53, 327, May 22, 1948.

The Food and Nutrition Board of the National Research Council meeting in Washington has lowered the daily calorie allowances for sedentary men and women by 100 calories. Protein allowances remain unchanged, while a reduction in thiamine requirement has been referred back to the committee for further study.

297H. Studies in human mineral metabolism. I. The effect of bread rich in phytate phosphorus on the metabolism of certain mineral salts with special reference to calcium.

WALKER, A. R. P., FOX, F. W., AND IRVING, J. T. *Biochem. J., 42,* 452-62 (1948).

The metabolism of calcium, magnesium and phosphorus, phytate phosphorus, and iron, was studied in three healthy adults for consecutive periods of 7 to 19 weeks during which time the subjects consumed (a) their usual diet, (b) a diet including 1 lb. of bread of 95 to 100% extraction flour, and (c) a diet including 1 lb. of bread of 70% extraction flour. During dietary periods (b) and (c), the calcium intake was restricted to 10 mg./kg. of body weight.

Ingestion of increased phytate phosphorus and in two cases decreased calcium led to a negative calcium balance, but given time, equilibrium was again reached and calcium losses were made good. The lower the calcium ingestion the greater became the amount of phytate phosphorus hydrolyzed. Increased phytate phosphorus decreased the magnesium retention at first but this was also made up later. The same was true of total phosphorus. The retention of iron did not change with increased phytate phosphorus intake.

298H. The nutritive value of cereal proteins in human subjects.

KUETHER, C. A., AND MYERS, V. C. *J. Nutr., 35,* 651-67, June, 1948.

Rolled oats (Quaker oats) and exploded oat cereal (Cheerios), as sources of nitrogen, are equally well utilized by adult human subjects when they furnish 55, 80, or 100% of the total dietary N, the remainder of the N being furnished by milk, when the total protein (N × 6.25) intake is approximately 0.70 g./Kg. body weight per day, and the caloric intake approximately 37.5 cal./Kg. body weight per day.

Both of these cereals at this intake level, furnish suboptimal amounts of lysine. Wheat flakes (Wheaties) and exploded wheat (Puffed Wheat Sparkies) are inferior to unprocessed whole wheat in the maintenance of nitrogen equilibrium. The wheat flakes are, however, better than the exploded wheat. The expanded corn cereal (Kix) and the corn flakes (Kelloggs) were identical with that of unprocessed whole corn in its ability to maintain N equilibrium in the adult human.

299H. Comparative growth-promoting values of the proteins of cereal grains.

JONES, D. B., CALDWELL, A., AND WIDNESS, K. D. *J. Nutrition, 35,* 639-49, June, 1948.

The growth-promoting values of the proteins of whole yellow corn, hard and soft wheat, pearled barley, brown and polished rice, rye and rolled oats were compared by means of *ad lib.* feeding with young albino rats, at 4.5, 7.5, 9.5, and 12% protein levels as far as the N content permitted.

On a basis of weight increase and gains per gram of protein consumed over a 6 week period, the values ranged in the following descending order at the 4.5% level; oats, rye, polished rice, brown rice. Corn, barley, hard and soft wheat showed about the same level which was less than the other cereals. Brown rice surpased all others at the 7.5% level. Rolled oats were much better than corn, wheat or barley. At the 9.5% level oats outranked wheat and rye. Hard and soft wheats were about the same. Oats were much higher than hard wheat at 12% level.

300H. Effect of administering agenized amino acids and wheat gluten to dogs.

NEWELL, G. W. et al. *Am. J. Physiol., 152,* 637-44, Mar., 1948.

No consistent or significant differences were observed between values for hemoglobin, hematocrit, red cell blood count, white blood cell count, prothrombin time, glucose, calcium, phosphorus, sulfur or vitamin C of the blood of dogs when fed agenized wheat gluten and when fed basal diet. Agenized wheat gluten did produce an increase in blood magnesium and potassium. Selenium toxicity in dogs is not related to the condition of running fits. Injection of magnesium, potassium or calcium pantothenate had no effect in preventing or lessening the intensity of seizures. No seizures developed on stomach tube feeding of various agenized amino acids.

301H. Supplemental value of certain amino acids for beef protein.

HOAGLAND, R. et al. *J. Nutr., 35,* 167-76 (1948).

The supplemental values of the amino acids cystine, methionine, phenylalanine, leucine, isoleucine, valine and tryptophan for beef protein were determined by feeding tests with young male albino rats. When protein constituted 10% of the diet, beef protein was deficient in cystine or methionine. Supplementation with 0.2% to 0.4% of either cystine or methionine increased the growth promoting value to that of egg protein.

At 12.5% protein level, beef protein was somewhat deficient in cystine, and the addition of this amino acid raised the value to that of egg protein. At 15% protein level, beef protein was not deficient in cystine and the growth-promoting value was equal to that of egg protein.

302H. Dietary approaches to the study of dental caries.

SHAW, J. H. *J. Am. Diet. Assoc., 24,* 181-5, July, 1948.

Evidence is presented to indicate the susceptibility to dental caries of four species of laboratory animals. There is some evidence that rations of high sucrose content have a caries-producing effect. Through the use of experimental animals, the effect of diets upon susceptibility to tooth decay can be studied in greater detail and with more controlled conditions than is possible in experiments with human subjects.

303H. Effect of mineral oil on the absorption of carotene and vitamin A in man.

Nutr. Revs., 6, 170-2, June, 1948.

A review of the literature tending to show that there is danger in prolonged use of mineral oil as a laxative due to a decreased absorption of vitamin A, and especially when the source of the vitamin is carotene.

304H. Some studies on the feeding of fish meals.

LANHAM, W. B., AND NILSON, H. W. *Comm. Fish. Rev., 9,* No. 8, 1-12 (1947); *Comm. Fish. Abst., 1,* 25, Mar., 1948.

Commercial fish meal prepared from pilchard, menhaden and lean marine groundfish fillet scrap was found to be an excellent source of protein in a properly balanced diet for growing chicks. These fish meals could be fed in fairly large amounts in diets and in only a few instances were fishy or off flavors detected in the flesh of the chicks at the end of six weeks. Experimental spoilage of these fish meals under conditions of high humidity and heat in an aerobic environment did not produce any toxic substances. Water-soluble growth promoting substances and vitamin K were synthesized by the bacteria and molds during the experimental spoilage of the meal.

PHYSIOLOGY

305H. Odor and infrared absorption.

MONCRIEFF, R. W. *Manuf. Chem., 19,* 174-5, Apr., 1948.

The infrared theory is not new. It was first put forward by Faraday and supported by Tyndall. As some substances which have absorption bands in the infrared are odorous and others are odorless, it is difficult to see how odor and infrared absorption can be directly linked. Other substances such as paraffin and carbon disulphide are odorous, but are transparent throughout the whole of the infrared spectrum . Experiments on insects are interesting, but even if it could be proved beyond doubt that insect behavior is determined by the character of infrared radiation reaching them, there would be no certainty that the sensation being investigated was that of olfaction.

306H. Theories on odors.

PRESSLER, C. E. *Drug Cosmetic Ind., 62,* 180-2, Feb., 1948; *Comm. Fisheries Abst., 1,* 19, May, 1948.

Conventional theories of the mechanism of odor sensation have asumed that direct contact between molecules of the odiferous gas and the sense organs must be made in order for a chemical reaction to stimulate the odor nerves. A more recent theory predicates odor sensation to be brought about as a result of infrared transmission between the odiferous gas and the odor sense organs. The latter theory was suggested by G. M. Dyson ("The scientific basis of odor," *Chem. & Ind. 57,* 647-51 [1938]). Even considerably previous to that time evidence had been obtained that infrared absorption was related to odor. Thus both Faraday and Tyndall (the latter in 1862) noted that butterflies were able to perceive odors at such dilute concentrations that it was unlikely that a single molecule of the substance reached them. Dyson was the first to propose an infrared theory for odor mechanism. More recently experimental work has been carried out at Yale University by Beck and Miles (1947) in which they have carried out experiments with insects. Insects could detect odors of substances within an hermetically sealed container with a window made of potassium bromide crystal (transparent to infrared) but not when such window was

made of material which absorbed infrared. The theory which they advance assumes that odor sensation is brought about when the odor organs absorb infrared radiation in the wave length range of 8 to 14 mμ.

FOOD PRODUCTS

BAKING AND BAKERY PRODUCTS

307H. Factors affecting the quality of cakes made with oil.

OHLROGGE, H. B., AND SUNDERLIN, G. *J. Am. Diet. Assoc., 24,* 213-16, Mar., 1948.

Methods of improving quality of cakes made with oil are discussed. There was found to be a high correlation between relative viscosity of the batter and acceptability score and between moisture absorption and acceptability score.

308H. High levels of α-amylase in baking. I. Evaluation of the effect of α-amylase from various sources.

JOHNSON, J. A., AND MILLER, B. S. *Cer. Chem., 25,* 168-78, May, 1948.

Improved response to malt supplements by the addition of ball-milled starch to normal flour is possible without the detrimental effects on gas retention usually noted when flour itself is overground. Fungal α-amylase was less effective than equivalent concentrations of malted wheat or barley α-amylase in reducing the maximum viscosity of gelatinized starch. Fungal α-amylase, however, was slightly more effective in increasing gas production and in yielding improvements in the bread denoted as malt response.

309H. High levels of α-amylase in baking. II. Proteolysis in straight and sponge doughs.

MILLER, B. S., AND JOHNSON, J. A. *Cer. Chem., 25,* 178-90, May, 1948.

Malt supplements containing excessive amounts of proteolytic enzymes caused sticky doughs, inferior texture and low loaf volume when the sponge procedure was used. No harmful effect was noted when using the straight dough procedure. Sodium chloride acted as a proteolytic inhibitor. The addition of sodium chloride to the sponge permitted the use of high levels of malt supplements without harmful effects.

CANNED FOODS

310H. The use of hexametaphosphate in the blanching of peas.

HOLMQUIST, J. W., SCHMIDT, C. F., AND GUEST, A. E. *Canning Tr., 70,* 7-8, April 26, 1948.

Laboratory and field studies have shown that the addition of sodium hexametaphosphate in amounts chemically equivalent to the amounts of calcium and magnesium in the blanch water will result in a definite softening of the skins of peas. It is indicated that the addition of amounts of sodium hexametaphosphate in excess of the quantity chemically equivalent to the hardness, results in further softening of the peas. Careful control of the concentration of sodium hexametaphosphate in the blanch water must be maintained in order to obtain satisfactory results.

311H. Canning of frozen salmon.

Pacific Fish., 46, 49, June, 1948.

Good fresh salmon frozen, even without glazing, up to 3 or 4 days before canning, then properly thawed and promptly canned, are not perceptibly different from the fresh-canned fish. If they are to be held for more than a few days, however, they should be glazed and held at low, uniform temperature, as if for the frozen fish market. Under those conditions they can be held for several months with satisfactory results; though in any case it is desirable to get them canned as soon as is practicable, as there are many possibilities of deterioration which increase with length of the storage period.

312H. Corrosion of containers for canned foods.

JACOBSEN, F., AND MATHIESEN, E. *Norwegian Academy of Science,* Math.-Natural Science Class No. 5, Oslo, 1946; *Fruit Prod. J., 27,* 180, Feb. 1948.

The corrosion reaction proceeds with or without evolution of gaseous hydrogen. The formation of hydrogen most markedly takes place in the case of products of high acidity and when the base metal (the steel) is in direct contact with the products. The more neutral products can dissolve considerable amounts of tin and in some instances also iron, without formation of gaseous hydrogen. Metal compounds which are formed as the corrosion proceeds in the cans of tinned steel, give the canned foods a disagreeable odor and taste. The corroding power of the various products is to a great extent determined by the content of cathodic and anodic depolarizers in the canned foods and by the properties of the can (pores in the tin-layer, content of minor constituents in iron, etc.). The reacting depolarizers differ for different kinds of food.

In canned fruits and berries other depolarizers than oxygen play an important part, namely coloring substances (Anthocyanins). In some vegetables nitrates possibly

can act as depolarizers. Canned products of marine origin, such as fish and crustacea contain another depolarizing substance, which to a very great extent outweighs the importance of the oxygen. This substance is trimethylamine oxide.

CEREALS AND GRAINS

313H. Practical aspects of cereal food standardization.

BEST, J. M., AND OLSEN, M. E. *Food, Drug, Cosmetic Rep., 3,* 204-15, June, 1948.

Under judicial interpretation to date, whenever an Administrator standardizes a food, he automatically outlaws all other foods which may be indistinguishable from it, irrespective of how beneficial the foods may be or how distinctively they may be labeled. Practical difficulties in amending the standards are discussed along with the procedure for standard making.

314H. Chlorine dioxide may be substitute for "Agene".

CRAWFORD, C. W. *Food Field Rep., 16,* 54, April 12, 1948.

According to Associate Commissioner C. W. Crawford, experiments thus far with chlorine dioxide indicate there is nothing in its effect on flour that could be harmful to man or animal. Chlorine dioxide seems to have a simple oxidizing effect on flour, leaving a small residue of common salt after treatment has been completed.

315H. Preservation of baked cereal food.

HOLDEN, E. G. Assignor to American Colloid Co. 2,443,138, June 8, 1948.

A baked cereal food containing an appreciable but small amount of bentonite.

316H. Conversion of wheat starch.

WALSH, J. G., LEVITT, D. M., AND GOODMAN, A. H. Assignors to Doughnut Corp. of America. 2,442,789, June 8, 1948.

The method of making crystallized dextrose from a wheat starch slurry containing 15 to 24% starch solids and 2 to 4% protein which comprises saccharifying the slurry with the protein remaining in it, then concentrating the saccharified liquor by multiple stage vacuum evaporation, and when the temperature of the liquor under concentration is reduced below 55° C., adding a proteolytic enzyme to the liquor to solubilize the protein, then crystallizing dextrose from the concentrated liquor, and subjecting the same to centrifugal separation to cause separation of the crystallized dextrose from the liquor and to cause the solubilized protein to pass off with the liquor.

317H. Flour-enriching composition.

WHITESIDE, R. S., AND KOLB, P. V. Assignors by mesne assignments, to Winthrop-Stearns, Inc. 2,444,215, June 19, 1948.

A stable, free-flowing enriching composition base of the character described containing fat-free, low moisture ashless starch filler, talc, tricalcium phosphate and monocalcium phosphate and being in the form of a substantially anhydrous homogeneous powder of at least about 300 mesh. A stable, free-flowing flour-enriching composition comprising fat-free, low moisture ashless starch filler, talc, tricalcium phosphate, monocalcium phosphate, vitamins B_1, B_2 and D, and niacin, and assimilable iron in the form of a substantially anhydrous homogeneous powder of at least about 300 mesh.

318H. Methods for determining flour particle size distribution.

WICHSER, F. W., AND SHELLENBERGER, J. A. *Cer. Chem., 25,* 155-67, May, 1948.

The determination of particle size distribution of wheat flour by sieving, air flotation, and sedimentation is discussed. Data produced by sieving procedure using Tyler wire screens and the Ro-tap shaker are consistently accurate, applicable to any size range above 37 μ and simple to run. Flour separation by air, using the Roller Air Analyzer, produces particle size distribution data below the size of 80 μ. The air procedure is more rapid than the other methods. A sedimentation method using the Andreasen pipette only, produced accurate data below the size of 50 μ.

DEHYDRATED FOODS

319H. A study of the browning reaction in whole milk powder and ice cream mix powder.

TARASSUK, N. P., AND JACK, E. L. *J. Dairy Sci., 31,* 255-68, Apr., 1948.

The conditions with respect to moisture content of powder, temperature of storage, and oxygen level in gas-free space of container, as they may affect the browning of dry milk and ice cream mix powder as a result of aging, are given. The changes accompanying the browning, such as carbon dioxide production, oxygen uptake, increase in reducing groups, decrease in solubility and development of caramelized flavor, have been studied. Browning is accompanied by a development of a specific flavor, a caramelized flavor, in contrast to the usual storage types which are generally stale or oxidized flavors.

320H. Effect of high-moisture storage on preservation of carotene in dehydrated alfalfa meal.

MITCHELL, H. L., SCHRENK, W. G., AND KING, H. H. *Arch. Biochem., 16,* 343-8, Mar., 1948.

Dehydrated alfalfa meals with a high moisture content lost less carotene during storage than did meals of low moisture content. Acids of fermentation formed during storage of high moisture content alfalfa increased carotene retention even in the presence of oxygen.

FATS AND OILS

321H. Flavor reversion in soybean oil. IV. Isolation of reversion compounds in soybean oil.

MARTIN, C. J., SCHEPARTZ, A. I., AND DAUBERT, B. F. *J. Am. Oil Chem. Soc., 25,* 113-7, Apr., 1948.

Reversion compounds were obtained by steam distillation, ether extraction and micro isolation from a reverted soybean oil. One of the compounds corresponded closely to α-heptenal, and the others were thought to be dicarbonyl because of the high melting point of dinitrophenyl hydrazone. Conjugated triene is suggested as a precursor to the formation of α-heptenal in reverted soybean oil.

322H. Herring for oil.

Canner, 106, 23, May 1, 1948.

Using new tested processes, Britain hopes to add considerably to her edible oil and fat supplies by the conversion of herring to oil, which can be used for margarine manufacturing, meal for cattle feed and other purposes.

323H. High fat ingredients for soup and the like and method of production.

HARREL, C. G., AND BROWN, R. O. Assignors to Pillsbury Mills, Inc. 2,440,604, April 27, 1948.

The method of producing fat-loaded farinaceous particles which consists in first exploding a multiplicity of farinaceous particles to convert the same into integral, cellular bodies, then mixing with a multiplicity of the cellular bodies, a fat ingredient in liquid state, subjecting the mixture to partial vacuum, then subjecting the mixture to a materially increased pressure to cause the liquid fat ingredients to be forced by pressure into the cells of the bodies and thereafter, cooling the particles to congeal the fat within the cells.

FISH AND SEAFOOD

324H. Probable cause of the browning of certain heat-processed fish products.

TARR, H. L. A. *Fisheries Res. Bd. Canada, Pac.,* No. 74, 17-18, Mar., 1948.

When fish flesh such as that of lingcod was leached in running water for some hours the brown discoloration which occurred on heat processing the untreated flesh was either absent or less intense, depending on the length of the leaching period. If a reducing sugar such as glucose was added to the leached flesh, heating caused marked brown discoloration. It was found that the oxygen of the atmosphere did not appreciably affect the intensity of the brown discoloration. Thus, fish flesh which was processed after sealing in glass containers in a relatively high vacuum browned to about the same extent as did fish flesh processed in open glass containers. Tests showed that the addition of sodium bisulphite (which liberates sulphur dioxide) to red cod flesh prior to heat processing either decreased or eliminated the intensity of brown discoloration. Finally, chemical tests showed that fish flesh contains either reducing sugars or related substances.

325H. Low-temperature air-lift fish meal drying.

DAVIS, H. C. *Pacific Fish., 46,* 59-61, June, 1948.

Operating on a low-temperature, large-air-volume basis, a new type air-lift fish meal dehydrating unit invented by Terminal Island Sea Foods, Ltd., was put into regular operation recently. Advantages thus far observed include economy of space and material, light foundations and reduction of fire hazard. Tests have shown the meal to be light and fluffy, with excellent color. A notable property is its freedom from tendency to cake or harden in storage. Moreover, the meal produced in the pilot plant tested exceptionally high in feeding value.

326H. Cholesterol from fish meal.

BEATTY, S. A. *Fisheries Res. Bd. Canada. Atl.,* No. 42, 6-7, April, 1948.

White fish meal, that is, meal made from waste cod, haddock, hake, cusk and pollock and other lean fishes, was found to contain between 6 and 10 lb./ton. Hence, the value of the cholesterol in the meal may be as great as the present value of the meal as a stock feed. The meal is extracted with ether or other fat solvent, and the oil is saponified. The prosphatides are precipitated with acetone, and the cholesterol is precipitated as the digitonide. The cholesterol is then iso-

lated and recrystalized from alcohol, or the digitonide is treated with glacial acetic acid and concentrated sulphuric acid, and the color which develops is compared with a standard cholesterol solution.

The oil in fish meal varies with the source of raw material but it usually runs between 3 and 5%. The unsaponifiable matter varies from about 7 to about 24% of the oil, and cholesterol constitutes 65 to 90% of the unsaponifiable matter.

FROZEN FOODS

327H. The application of corn syrup in the freezing preservation of fruit.

SATHER, L., AND WIEGAND, E. H. *Quick Frozen Foods, 10,* 81-3, May, 1948.

Previous work showed a superior product using a 50° Balling syrup, 80% sucrose, 20% dextrose. However, greater replacement with dextrose was impossible since it recrystallized at low temperature. Excellent results were obtained at Corvallis using 40 and 50° syrups of 50% sucrose, 50% corn syrup. A superior texture, flavor and color resulted as well as a higher drained weight. Red and Blue label Karo's and enzyme converted syrup were tried. Red label was the most successful, with enzyme last.

328H. Determination of maturity of frozen lima beans.

LEE, F. A. *Canner, 106,* 17-20, May 29, 1948.

A method is described, based on specific gravity, for the determination of maturity of frozen lima beans modified from that originally proposed for peas. It appears to be a good index of maturity of lima beans and can be used for the all-green varieties. The alcohol-insoluble solids were determined directly from the thawed beans without further processing, and this method also appears to be a good index of maturity of lima beans and can be used for the all-green varieties. Data are presented regarding the use of the texture-meter for evaluating the maturity of blanched lima beans in the processing plant.

329H. Retardation of rancidity in frozen fish by ascorbic acid.

BAUERNFEIN, J. C. et al. *Quick Frozen Foods, 10,* 68-72, April, 1948.

Dipping fatty type fish in ascorbic acid solutions prior to freezing is effective in combatting rancidity formation. The recommended level is 100-250 mg./lb. of fish. The usual brine treatment tends to accelerate rancidity and "salt fish" flavors.

330H. High temperature-short time pasteurization of ice cream mix.

MINTHORN, C. M. *Milk Plant Monthly, 37,* 2, 70-3 (1948); *J. Dairy Sci., 31,* A80, No. 206, June, 1948.

Ice cream mix may be pasteurized successfully by high temperature-short time pasteurization. Usually a higher temperature than the standard 160° F. for 15 seconds is employed. The temperature recommended is 176° F. for 22 seconds. It is concluded: (a) Ice cream mix can be heated without burn-on continuously for long periods of time. (b) Heating of ice cream mix containing frozen fat from storage temperature to 125° F. in less than 1 min. prevents oxidation of the fat. (c) High temperature-short time pasteurization decreases the amount of equipment, with a saving of time and labor. (d) When mix is prepared in a condensing pan, high preheating temperatures can be used for increasing efficiency of the condensing equipment and, even more important, for stabilizing milk solids.

331H. Drying of frozen materials by heat radiation.

LEVINSON, S. O., AND OPPENHEIMER, F. Assignors to Michael Reese Research Foundation. 2,445,120, July 13, 1948.

In a process for the drying of a liquid containing solids, the steps of maintaining such material in a frozen state by exhausting the atmosphere in a closed system to reduce the temperature below the freezing point of the liquid, supplying the heat of sublimation thereto by the radiation of a hot body emitting at least 60% of its radiation in the spectral range of 1μ to 10μ and having a maximum intensity of radiation within the range of from 1.6μ to 5.5μ, and removing vapors liberated by such sublimation, the radiation from the hot body being continuously applied during the drying operation.

FRUIT AND FRUIT JUICES

332H. Further studies on the use of calcium chloride to maintain firmness in canned and frozen apples.

ESSELEN, W. B., HART, W. J., AND FELLERS, C. R. *Fruit Prod. J., 27,* 8-13, Sept., 1947.

Detailed review of previous work is given, and the effectiveness of using calcium chloride in firming apple is reaffirmed. Use of calcium chloride is often combined with methods to prevent darkening of the product. The effectiveness of calcium and penetration of sulfur dioxide to prevent darkening are accentuated if the dipping solution has a pH range of 2.7 to 2.9. A satisfactory product is

obtained when a five minute dip in 0.1% calcium chloride solution is used. In this study no off-flavor could be noted.

333H. Internal fruit quality as related to production practices.

SITES, *J. W. Citrus Ind., 29,* 20-23, May, 1948.

Beginning with the admission that the present legal test for "maturity," the ratio of soluble solids to acid, is not a satisfactory means of determining quality of citrus juice, the author undertakes, first, a review of all the factors which affect that quality. Weather is believed to be the largest influence, but a correlation of "high" and "low solids" years with weather statistics failed to reveal individual weather characteristics responsible. Fertilization in general and source of nitrogen are also covered in this installment. Source of nitrogen seems to be without effect on citrus nutrition.

334H. Condition of oranges as affecting bacterial content of frozen juice with emphasis on coliform organisms.

WOLFORD, E. R., AND BERRY, J. A. *Food Res., 13,* 172-8, Mar.-Apr., 1948.

Juice prepared experimentally from "soft rot" Valencia oranges was found to contain a microbial population approximately 2,500 times as great as juice similarly prepared from sound fruit. The coliform content was also much greater. Even after prolonged storage at 0° F., the viable organisms in the juice from unsound fruit were more numerous than those found in the freshly prepared juice from sound fruit. A number of coliforms were still viable after eight months' storage at 0° F. in the "soft rot" juice, while no coliforms were isolated from the "sound" juice, which had a low initial coliform count, after as little as one month of freezing storage.

As a rule the coliforms isolated from the juice were characteristic of the *Aerobacter* genus. Of 46 isolates from "soft rot" only three, or 6.5%, were *Escherichia,* and but one of these three appeared to be *E. coli.* Three isolated from "good" juice appeared to be *Aerobacter.* Elimination of unsound fruit is obviously of prime importance in the production of frozen orange juice of low microbial count and coliform index.

335H. Apparatus for extracting oil-free juices.

MCKINNIS, R. B. 2,444,203, June 29, 1948.

An apparatus for extracting juice from segments of citrus fruit comprising a rotatable drum member having a smooth cylindrical peripheral surface, and a smooth stationary plate member spiraling toward the peripheral surface of the movable drum forming therewith a gradually constricting passageway having an input end and an output end, the stationary plate member being spaced from the peripheral surface at the input end of the passageway a distance substantially the thickness of the fruit peel, the drum member being adapted to move the fruit segments through the constricting passageway to extract the juice therefrom, the plate having longitudinal slots therein extending from a region of the plate which is spaced from the drum a distance substantially equal to the thickness of the fruit peel plus the thickness of the fruit seed to a region which is spaced from the drum substantially the thickness of the fruit peel, the slots having a width sufficient to permit passage of seed from the passageway thereby permitting further compression of the fruit segment and complete extraction of juice therefrom.

336H. Retention of desirable color in strawberry products.

KERTESZ, Z. I., AND SONDHEIMER, *E. Farm Res., 14,* 16, July, 1948.

The red pigment was recently isolated and identified as pelargonidin 3-monoglucoside. The isolated crystalline pigment is now being used in model experiments in artificial mixtures. The aim of these experiments is to simulate conditions as they exist in the natural product and thus give information on the factors involved in color deterioration during manufacture and storage. In the commercial production of preserves, efforts are made to keep processing temperatures low and cooking times as short as possible. The common use of vacuum pans and the application of pectin in the mixture accomplish a great deal in this direction. It is also generally recognized that high temperatures during the storage of strawberry preserves should be avoided. Storage studies brought out the surprising fact that there is a critical temperature around 60° F. above which the loss of color becomes much accelerated.

Although the red color of strawberries due to the anthocyanin pigment is of major importance, other color factors also play a significant role. This is especially true of strawberry products. As the "primary" red color is lost, yellow and brown "secondary" coloration develops which eventually leads to an unappetizing appearance. Research on these "browing pigments" is difficult because they change not only in color but also in chemical composition at their various phases of development. As yet no dependable method of measurement has been found.

PECTIN—JAMS AND JELLIES

337H. Derivatives of pectic acid as models of proteins.

DEUEL, H., AND NEUKOM, H. *Nature*, 159 (4052), 882 (1947); *Biol. Abst., 22,* 272, No. 2996, Feb., 1948.

Ethylenediamine and other derivatives of pectic acid are long chains in which every link carried a chain ending in a primary amino group. The soln. forms a gel with formalin, forms insoluble salts with high molecular weight acids, and precipitates pectic acid itself. Other derivatives with both amide and carboxyl groups are ampholytes which can be studied by the usual protein chemistry methods, thus offering a chance to correlate properties with well established structure.

338H. Pectic materials and method of preparing same.

OWENS, H. S., AND MACLAY, W. D. Assignors to the U. S. A. as represented by the Sec. of Agri. 2,444,266, June 29, 1948.

The process of preparing pectinic acids of low methoxyl content which comprises subjecting an aqueous disperson of citrus peel to partial demethoxylation by enzymic hydrolysis, the hydrolysis being attained by adding an alkali to the dispersion and maintaining the dispersion at a pH of 6 to 10 and a temperature of 0° C. to 60° C. until the low-methoxy pectinic acids are formed, the enzymic demethoxylation being in the presence of a small amount of sodium hexametaphosphate.

339H. Pectic enzymes. VIII. A comparison of fungal pectin-methylesterase with that of higher plants, especially tomatoes.

MCCOLLOCH, R. J., AND KERTESZ, Z. I. *Arch. Biochem., 13,* 217-28 (1947).

Pectin-methylesterase (PM) obtained from higher plants show definite similarity in their pH-activity relationship. Experiments are reported to indicate that tomato PM behaves essentially similarly to alfalfa and orange PM studied by other investigators. The PM in Pectinol, produced from mold cultures, has a pH-activity curve different from those of higher plants. The salt activation of purified tomato and Pectinol PM indicated differences in the two enzymes. The enzymes in the same reaction mixture appear to be able to act independently. The two enzymes also differ in their resistance to chemical inactivating agents, especially detergents. The PM of Pectinol and that of tomatoes also differ in temperature quotients, energies of activation and rates of thermal inactivation. Further differences in the behavior of the two enzymes when exposed to ethanol or during dialysis are stated. The above information is taken as strong evidence that there are at least two enzymes capable of demethylating pectin, one occurring in higher plants and the other in commercial pectinase preparations made from mold cultures.

340H. Protection of Escherichia coli against bacteriophage with citrus pectin.

MAURER, F. D., AND WOOLLEY, D. W. *Proc. Soc. Expt. Med. & Biol., 67,* 379-83, Mar., 1948.

Citrus pectin enables *E. coli* to grow in the presence of its bacteriophage. Effect of pectin was not to destroy the phage, did not prevent at attachment of virus to host cell but did protect cells from lysis. Gum acacia and starch ineffective.

341H. Effect of processing and storage on the quality of gelose from Irish moss.

MACDOUGALL, D. *Canadian J. Res., 26F,* 160-7, Mar., 1948.

Studies on Irish moss from Canada's East coast showed that optimum pH for extraction of gelose is 6-7. Comparison of drum drying and drying from the frozen state showed little difference in suspending power, but drum drying caused lower viscosity. Storage at 0° and 40° F. for 12 weeks caused no change, but storage at 80° F. and 140° F. caused rapid deterioration. Relative humidity has less effect on deterioration in storage than temperature.

342H. Present status of the manufacture and use of volatile fruit concentrates.

MILLEVILLE, H. P. *Fruit Prod. J., 27,* 99-101, Dec., 1947.

The volatile apple concentrate produced by the process of the Eastern Regional Lab. may contain from a trace to a few per cent of alcohol. If it contains more than 0.5% it is subject to government regulation and alcohol tax. When added to apple jelly at the rate of 1 ml. of 135-fold concentrate to 1 lb., the improvement in flavor is notable, but such jelly is adulterated under present Federal standards for preserves. It is argued that steps should be taken to overcome both of these restrictions.

SUGARS, STARCHES, AND SYRUPS

343H. Solid corn syrup manufacture.

FETZER, W. R. Assignor to Union Starch & Refining Co. 2,439,384, April 13, 1948.

The method of producing corn syrup solids which comprises heating liquid corn syrup of a commercial Baumé of from 43° to 46° under greater than atmospheric presure to a temperature of from 232° to 350° F. and extruding the heated liquid corn syrup through a nozzle into the presence of a vacuum of from 28 to 29½ inches so that the corn syrup flash boils into a continuous expanded rope-like structure of dehydrated corn syrup having intercommunicating cells and having a moisture content of from 1 to 6%.

344H. Correlating viscosity, temperature and concentration of sucrose solution.

OTHMER, D. F., AND SILVIS, S. J. *Sugar, 43,* 32-3, May, 1948.

Methods previously developed for expressing liquid viscosities as a temperature function based on the viscosity of a reference substance, have been applied to the aqueous solutions of sucrose. For solutions of constant concentration, straight lines result on logarithmic paper when viscosities are plotted versus the temperature scale calibrated from the viscosity of water. This relation has then been developed into a nomograph for these solutions in a range up to 75 weight per cent (°Brix) and for temperatures between about 0° and 100° C., and through a viscosity range of 0.6 to 6,000 Centipoises.

345H. Starch stabilizer.

LLOYD, R. L. Assignor to American Maize-Products Co. 2,442,658, June 1, 1948.

A starch stabilizer of abnormally low settling rate when suspended in an aqueous medium, the stabilizer comprising a mixture of substantial proportions of pregelatinized and nongelatinized starch.

346H. Purification of syrups by solvent extraction.

GAYLOR, P. J. 2,442,804, June 8, 1948.

The method of purifying colored aqueous sugar syrup of about 50 to 70° Brix comprising extracting the syrup with a water soluble organic cyclic ether having two oxygen atoms per molecule and having a boiling point below 130° C., thereby obtaining an extract layer and a syrup layer, separating the layers, distilling the extract layer to recover the ether, and recycling the ether to the extraction step.

TASTE TESTING

347H. The organoleptic characteristics of beer.

LUERS, H. *Brewers Digest 22,* No. 7, 83T (1947); *Wallerstein Lab. Commun., 10,* 248-9 (1947).

The gustatory and olfactory senses are discussed in relation to the taste of beer, and various factors comprising the flavor appeal of beer are reviewed. The sense of touch is stimulated principally by the evolution of carbon dioxide and to a lesser degree by the contact of the colloidal particles of the beer with the mucous membranes of the mouth. Of the four taste qualities, saltiness, sweetness, and sourness are perceived almost simultaneously and also disappear rapidly after drinking, while bitterness is tasted last and persists longest. The sense of smell is affected by the aromatic substances which are volatilized partly by warm and partly by the evolved carbon dioxide. Smell and taste are closely interrelated. The sense of vision is impressed not only by the foam, but also by the color and clarity of the beer, the color often being erroneously correlated with its extract content. The organoleptic properties of beer are largely determined by the raw materials used and the methods of production employed. Off-flavors and off-colors can frequently be traced to faulty processing, improper ingredients, microbial infections, or yeast weakness.

348H. Systematic study of the influence of oxidation on beer flavor.

GRAY, P. P., STONE, I., AND ATKIN, L. *Wallerstein Lab. Commun., 10,* 183-93 (1947).

Organoleptic testing by the "difference method" has been applied to oxidized beer samples. As a possible distinction between aroma and taste was envisioned, each individual test was divided into two parts. The subject was first asked only to smell the sample and to form a judgment on the basis of aroma. After this decision had been recorded and the beakers again randomized, the subject was asked to taste the beers and to form another judgment. It is emphasized that the object of these flavor measurements was the determination of differences between beers under comparison. In no sense should these tests be considered as in any way attempting a measure of consumer preference. Although opinion after passing judgment as to their perception of a difference, the importance of these opinions was minimized in the treatment of the data and no analysis of them has been made. The members of the flavor panel were drawn from laboratory and office personnel and represent, for the most part, untrained and consequently, unprejudiced subjects; that is, without established preferences or sensitivities. In the course of the work the performance of the various individuals on the panel was examined by comparison of individual results with group

results, and except for the elimination of obvious non-tasters, no apparent advantage could be obtained by the selection of a so-called "expert panel"; that is the group showing greatest consistency.

349H. Off-flavors in market milk.

SCHOCK, A. A., AND BREAZEALE, D. F. *Milk Plant Monthly, 36,* 9, 28 (1947); *J. Dairy Sci., 31,* A86, No. 222, June, 1948.

Causes of off-flavors of milk are summarized. The milk off-flavors are classified as follows: (a) those transmitted by the cow, (b) those absorbed directly by the milk from the atmosphere, (c) those that gain entrance into milk directly from bacterial contamination, and (d) those resulting from enzymatic, chemical and photochemical changes occurring in the milk. In order to provide consumers with wholesome milk having a pleasing flavor, milk processors should pay especial attention to intake selection of milk, cleanliness of equipment, stainless steel construction, processing temperatures, and a daily check on the bottled product. Special emphasis is placed on the importance of having a well trained man who knows milk flavors at the receiving platform.

350H. Method of removing the nondesirable taste-impairing organic substances contained in cocoa berries.

WIDEN, O. E. 2,441,861, May 18, 1948.

Method of removing the nondesirable, taste-impairing organic substances contained in the cacao bean, characterized by blowing superheated steam of a pressure below atmospheric through a heated mass of ground cacao unmixed with other substances.

ORGANIC CHEMISTRY

351H. Hydroxylation of 2, 3-dihydropyran and the application of desoxyaldopentoses in the browning reaction.

HURD, C .D., AND KELSO, C. D. *J. Am.* Chem. Soc., 70, 1484-86, April, 1948.

Mono- and disaccharide-like compounds have been obtained by hydroxylation of 2, 3-dihydropyran, using hydrogen peroxide in t-butyl alcohol and osmium tetroxide. The implications of the fact that tetrahydropyran-2, 3-diol may be regarded as 3, 4-didesoxy-aldopentose are expounded. This compound gives rise to a strong brown coloration in its reaction with glycine, whereas 2, 3, 4-tridesoxyaldopentose (tetrahydropyan-2-ol) does not, thereby demonstrating the importance of the α-hydroxy aldehyde function in this reaction.

352H. Chemical composition and properties of guar polysaccharides.

HEYNE, E., AND WHISTLER, R. L. *J. Am. Chem. Soc., 70,* 2249-2252, June, 1948.

Guar flour can be readily separated into a water soluble (86-87%) and a water insoluble component. The water soluble component contains only small amounts of nitrogen and phosphorus impurities. By gradual addition of ethanol to an aqueous solution of the water soluble component, it is separated into 17 fractions. Analyses of the fractions indicate that the third to the twelfth fractions are identical as to composition and represent a galactomannan polysaccharide which contains 34.5% D-galactose anhydride and 63.4% D-mannose anhydride. This polysaccharide is given the name "guaran."

Presence of α-D-glycosidic linkages in guaran is indicated by its rapid acid hydrolysis with accompanying decrease in specific rotation and by its hydrolysis under the action of diastase. Guaran may be esterified easily to the triacetate which may be cast into a strong, flexible film. On stretching to 550% the film becomes strongly birefringent but yields only an amorphous X-ray pattern. It is assumed that the guaran molecules are linear or highly anisodimensional but have either a random distribution of D-galactose and D-mannose units in the molecular chains or that the chains have very short branches.

353H. The polysaccharides of carragheen. Part II. The gigartina stellata polysaccharide.

DEWAR, E. T., AND PERCIVAL, E. V. V. *J. Chem. Soc.*, 1622-26 (1947).

Air dried seaweeds were washed in muslin bags with running water 10 days, then repeatedly extd. with hot water on steam bath until exts, were no longer viscous, filtd. hot, concd. in vac. and brown viscous solution added to EtOH, dehydrated in EtOH, EtO_2 washed and dried. Also dialyzed against HCl to form free acids. Salts from *Gigartina stellata and Chondrus crispus:* galactose 40, 36.9%: SO_4 23.9, 23.8%. Free acids, SO_4 25.9,% equiv. wt. 371. Position of SO_4 group: it is believed to be attached to carbon 4, and that the residues are linked through 1 and 3 positions as in agar, and that this linkage may be typical of the galactans of the red seaweeds.

354H. Production of vanillic acid.

PEARL, I. A. Assignor to the Institute of Paper Chemistry. 2,441,839, May 18, 1948.

In the process of preparing vanillic acid substantially free from protocatechuic acid, the improvement which comprises reacting vanillin with fused potassium hydroxide at a

temperature of about 115°-235 °C., for a period of time not exceeding the point at which a test sample of the reaction mixture dissolved in water and neutralized turns green on the addition of aqueous ferric chloride.

PACKAGING

355H. New weatherproof adhesive for corrugated board.

KILLINGER, J. E. *Fibre Containers, 33,* 41-2, June, 1948.

The adhesive developed during the war for use in manufacturing weatherproof cases was a mixture of starch and urea formaldehyde resin which could be operated only at increased temperatures and in an acid condition. A new adhesive combination of starch and an acetone formaldehyde can be worked at lower temperatures and in a basic condition. Since it is basic, this adhesive permits the use of glue aiders such as borax and caustic soda and results in faster production.

356H. Tailored adhesives for corrugated board.

WILLS, J. H. *Paper Tr. J., 127,* 47-51, July 8, 1948.

The sodium silicate-clay adhesives were developed out of a recognition of the properties needed for modern high speed production of corrugated board. More dilute liquid phases promoted proper wetting and gave added strength. A slightly higher ratio of SiO_2 to Na_2O reduced the water loss required for initial set, gave faster set, and increased resistance to high humidity. These advantages were made possible by the addition of well selected quantities and types of clay. Besides lowering further water loss required for initial set, the clay controlled penetration and provided a gel strength which aided in fast set and the development of well formed bond structures.

It is estimated that initial set of sodium silicate adhesives occurs at about 40,000 poises. The effect on the board of the water loss required for initial set is calculated and is shown to be a critical factor in the production of board which is stiff at the take-off.

357H. Fresh apples.

Pack. Systems, 4, 16, June, 1948.

Iowa State College and the Goodyear Tire and Rubber Co. cooperated in a study which shows that orchard freshness of apples can be maintained for almost a year by lining the shipping cases with Pliofilm.